UNIVERSITY OF MICHIGAN
DEC 9 1953
EDUCATION LIBRARY

The American Biology Teacher

A PRACTICAL SERVICE AND IDEAS PUBLICATION FOR TEACHING AND RESEARCH IN THE LIFE SCIENCES FROM THE ELEMENTARY GRADES THROUGH COLLEGE

Official journal of

The National Association of Biology Teachers

DECEMBER, 1953 VOL. 15, NO. 8

BOSTON NATIONAL CONVENTION ISSUE

CONTENTS

Photomicrographs as a Laboratory Teaching Aid in the Biological Sciences
Normal L. Biggs and Norman O. Levardsen 201

A Modern Suite of Biology Rooms
Irving C. Keene 205

A Fossil Story For Children .. Loye Miller 207

1953 Annual Convention Program 210

"How I Did It" ..... Sister M. Gabrielle 212

The Use of Drosophila Melanogaster in High School Genetics
Andreas A. Paloumpis 213

Across The Editor's Desk 216

Letters 217

Biology Laboratories 218

Hydroponics—New Techniques
Brother G. Nicholas 219

A "Your" Man Teaches Biology
Helen Field Watson 221

Books for Busy Biologists 221

Biology in the News 223

MERRY CHRISTMAS AND A HAPPY NEW YEAR!

NEW SCIENCE FILMS

16mm sound films for elementary grades

LIVING SCIENCE SERIES NO. 1
(6 min. ea. color $60. Series $100)

ATTRACTING BIRDS IN WINTER
BUILDING BIRDHOUSES

LIVING SCIENCE SERIES NO. 2
(6 min. ea. color $60. Series $200)

BIRDS THAT EAT FISH
BIRDS THAT EAT FLESH
BIRDS THAT EAT INSECTS
BIRDS THAT EAT SEEDS

BIOLOGY FILMS

Other Biology films available for junior high and up including John Nash Ott's color series, in time-lapse photography on the growth of flowers and trees.

Write Dept. BF for new catalog.

INTERNATIONAL FILM BUREAU, INC.
57 E. Jackson Blvd., Chicago 4

THE CAROLINA SERVICE OFFERS . . .

- A complete culture collection of Bacteria, Fungi, Algae, Protozoa and Invertebrates.
- Quality Biological and Botanical Preserved Materials.
- Microscope Slides, Kodachromes and Plast-O-Mounts guaranteed to give satisfaction.
- Carefully selected Dissecting Instruments and Supplies.
- Microscopes and Accessories to meet the need of biological laboratories.
- General Laboratory Apparatus including glassware, ovens, balances and other apparatus.
- Chemicals, Inorganic and Organic, Stains, and Solutions.

DEPENDABLE SERVICE
A guarantee of complete satisfaction.
Quality materials at reasonable prices.

CAROLINA BIOLOGICAL SUPPLY COMPANY
Elon College, North Carolina

NEW NYSSCO MAMMALIAN CHARTS

Rat, Pig, Cat

A NEW series of six "Nyssco" charts, fully colored, and accompanying series of eight Laboratory Note-Book and Test Sheets.

LARGE, scientifically accurate charts for courses in Biology, Zoology, Comparative Anatomy, etc. They are well-planned, with the figures beautifully and artistically executed in vivid contrasting colors. The Nyssco Biology Chart Series are on the N. Y. City Board of Education Supply List, as well as on the approved lists of numerous Boards of Education throughout the country.

THE charts are cloth-backed, size 36" x 50". With wood rollers, — $8.75; Test Sheets (8½" x 11"), — $2.75 per C, $.50 per dozen of a kind.

Chart No.		Titles	Test Sheet
BEC 540	RAT	Internal Anatomy	BT 540
BEC 541	"	Circulatory System	BT 541
BEC 550	PIG	Internal Anatomy	BT 550
BEC 551	"	Circulatory System	BT 551
BEC 560	CAT	Internal Anatomy	BT 560
BEC 561	"	Circulatory System	BT 561

Ask for Cat. No. 7J—"Nyssco Biology Models and Charts."

EST. NYSSCO PRODUCTS 1919

NEW YORK SCIENTIFIC SUPPLY CO., INC.
General Supplies for Biology and Chemistry
28 West 30th Street **New York 1, N. Y.**

Photomicrographs as a Laboratory Teaching Aid in the Biological Sciences

NORMAN L. BIGGS and NORMAN O. LEVARDSEN, Northern Illinois State Teachers College

Within the last few decades many supplementary teaching aids have been developed to make the laboratory teaching of the biological sciences more effective. It is felt, however, that the possibilities of using photomicrographs as a laboratory teaching aid are being overlooked. The work of Northern is being done on the college level, but it is felt that the same general applications could very easily be carried over to the high school.

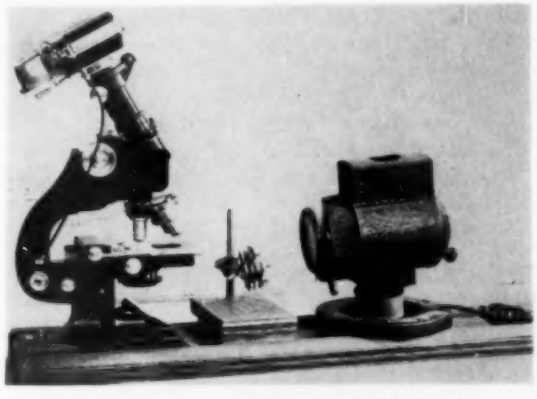
Equipment for Photomicrography

The authors do not intend to go into the fine points of the mechanics of photomicrography, but rather, to present the type of equipment that has been used satisfactorily. A brief discussion will follow of the equipment found to be needed for photomicrography.

Microscope. The microscope used for magnifications between 100× and 970× was a Spencer Model 13, inclined binocular, compound research microscope. It was equipped with a mechanical stage, adjustable Abbe 2-substage condenser, and iris diaphragm; an adjustable flat surface mirror, a 1.8-mm. oil immersion, 4-mm. dry and 16-mm. dry achromatic objectives, and a Huygenian 10× eyepiece. It was used in its ordinary vertical position. A monocular microscope of the same caliber would have worked, no doubt, just as well. For magnifications of 6.6× to 30×, a Bausch and Lomb Model BKW-5, senior stereoscopic microscope was used.

In general, it can be said that one should be satisfied only with the best microscope that is available, as the quality of the microscope will be reflected in the final photomicrographs.

Illumination. The source of illumination presented the greatest problem in adapting available equipment to photomicrography. A Spencer Model 370 adjustable laboratory lamp using an ordinary 140-watt, 115-volt projection bulb was found most satisfactory. The Kohler method of illumination, which is a standard method, was used in conjunction with this lamp. Most microscope manufacturers supply information as to the use of the Kohler method with their equipment. It is suggested that before one undertakes the process of producing photomicrographs he study and experiment with illumination.



The equipment used for photomicrography.

Time spent in this manner will be reflected in the quality of the final product. This suggestion cannot be emphasized too strongly.

Filters. The use of filters may not be a necessity when using color film, but they should be utilized if maximum details are to be expected in photomicrographs of stained slides with black and white film. A simple filter holder was made which accommodates three filters so that various color combinations might be utilized.

Camera. Choosing a camera may or may not present a problem to the beginning photomicrographer. If he already has a camera he may want to prevent any additional expense by trying to adapt what he has to photomicrography. For one who is about to purchase a camera to be used for such work, several designs and features must be taken into consideration. This is especially true if the camera is to be one of such nature that it can also be used for general photographic work. The authors used a 35-mm. Kine Exakta, which is well adapted to both general photographic work and photomicrography. This

reflex camera has a single lens and a reasonably priced attachment which adapts it to photomicrography.

Listed below are some important features to be considered in choosing a camera for this type of work. These could apply whether the camera is to be used solely for photomicrography or general photography as well.

1. The camera should be economical to operate; that is, it should take standard size and make of film.
2. It should incorporate some sort of a single lens reflex system of focusing, or else have an attachment which will enable focusing to be done on a ground glass.
3. It should be easily attached to a microscope or else supported above the microscope.
4. It should preferably have a removable lens, as the eyepiece and objective of the microscope will function in this capacity.
5. It should have a focal plane shutter, particularly if the lens is to be removed.
6. It should, of course, be in good working order and be light tight.

Film. The choice of film for photomicrography is dependent on the type of camera that is to be used. If one has settled on a 35-mm. he will be limited to three or four types of film. The 35-mm camera is probably the cheapest to operate, especially if the film is bought in bulk. This size film is easy to handle and process and is readily made into 2×2 inch transparencies or filmstrips, both of which are widely used. The greatest disadvantage of 35-mm. film is its ultimate size of enlargement. However, satisfactory enlargements were obtained using Kodak Micro-file film which has a high resolving power. With some of the larger size films the initial cost of the film and the processing increases, but one has a negative which will stand greater enlargement or it can be used without enlargement to make contact prints.

New 1952 Model!
35-mm. EXAKTA "VX"
Single Lens Reflex Camera

One lens both for viewing and picture taking assures perfect sharpness, accurate exposure, maximum depth of field, and correct composition for color. You always see the exact image before you take the picture—whether the subject is an inch or a mile away, whether it is microscopic or gigantic, whether it is moving or stationary. Instantly interchangeable lenses permit telephoto, wide angle, close-up, copy and microscope photography. **With f2.8 Zeiss Tessar "T" Coated Lens with Pre-Set Diaphragm Control ..... $279.80 tax included**

Write Dept. 900 For Free Booklet "I"

NATURE PHOTOGRAPHY WITH THE HIGH-SPEED FLASH by Alfred M. Bailey (Denver Museum of Natural History). This eminent explorer and scientist displays his finest Exakta photographs and others along with explanatory material. 35 full page photographs. 64 pages **50c**

EXAKTA CAMERA CO.

48 W. 29th St. New York 1, N.Y.

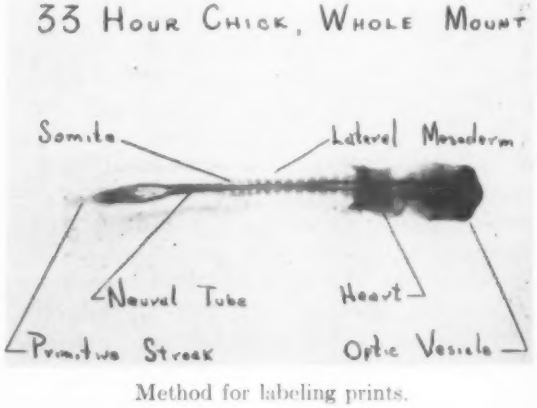
Preparing Photomicrographs

Since a brief synopsis of the equipment needed for photomicrography has been given, a few possibilities and suggestions for preparing these photomicrographs for use in laboratory teaching will next be considered.

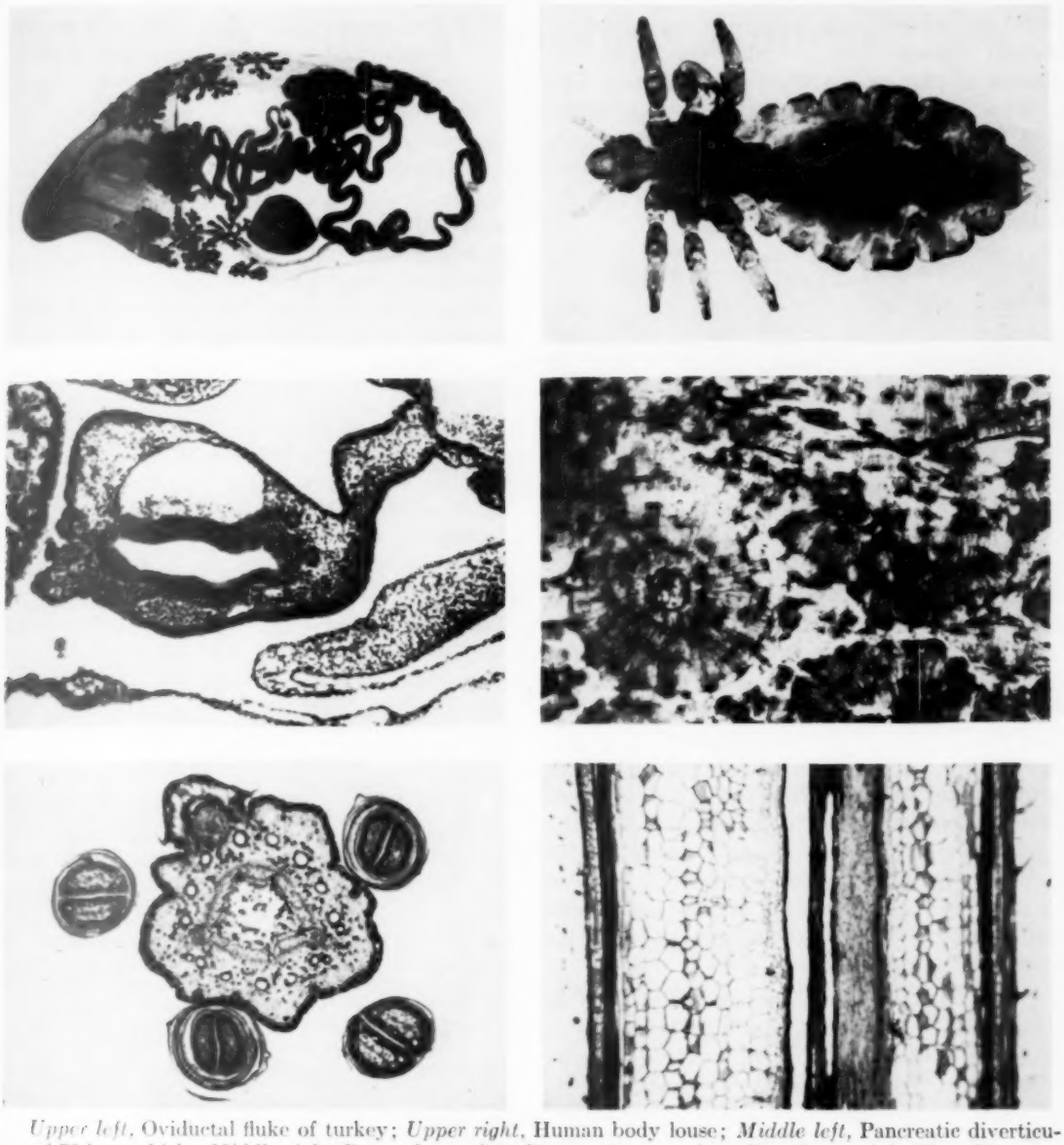
Prints. It has been found that making standard photographic prints of the photomicrographs is a very satisfactory way of using them. The junior author used photomicrographs as an instructor's set that could be used individually with the students. The photomicrographs were printed as 3×5 inch photos and then glued on 4×6 inch file cards. An identifying caption was typed on each card. This size was chosen because it produced a photograph approximating the size of the drawings that the students were making. Such cards were not of unwieldy size.

Method for Labeling Prints

There are several possibilities for preparing photomicrographs for use as photographic prints. Among these are a set for each student, several sets for the entire class, a large set to be placed in some central location as a



Method for labeling prints.



Upper left, Oviductal fluke of turkey; *Upper right,* Human body louse; *Middle left,* Pancreatic diverticulum of 72-hour chick; *Middle right,* Bone; *Lower left,* Pine meristem and needles; *Lower right,* Cucurbit stem.

reference, and also a set for the instructor. The ingenuity of the individual instructor would lead to the best means of preparation of the photos for his specific requirements.

Slides or Transparencies. This is probably one of the most popular forms of preparing photos for viewing by a group. Not only do slides usually give good detail, but also they last many years if properly cared for. They can be stored in a relatively small space. They are not difficult to make and can be made in either of two sizes; 2×2 inches or $3\frac{1}{4} \times 4$ inches. Almost every educational institution will have a projector that will take one if not both of these sizes.

Referring back to the sections on cameras and films, it will be remembered that one of the advantages of using 35-mm. equipment was the fact that 35-mm. negatives can be made easily into 2×2 inch slides, either black and white or color.

The process of making $3\frac{1}{4} \times 4$ inch slides is similar to that for the 2×2 slides and the finished product is just as satisfactory. However, the larger slide increases the storage problem.

Filmstrips. One way to incorporate several photomicrographs into a specific unit is to make them into a filmstrip. These filmstrips serve the same purpose as transparencies, but

have an added advantage of requiring a smaller storage space. Also the exact sequence of photos is always maintained. The process for making filmstrips is similar to that for making slides, except that more care must be taken in masking out undesirable photos and assuring correct exposure for the entire strip.

Specific Uses for Photomicrographs

There are several ways of using photomicrographs in laboratory teaching of which three are discussed below.

Where the Supply of Microscope Slides is Limited. In many teaching situations, especially in the high school, the supply of microscope slides is limited. In this case a photomicrograph can serve the students for preliminary study. In this way students will become familiar with the specimen before looking at the actual slide. It will also give them a reference to use after viewing the slide.

To Decrease Instruction Time. In the case of a large laboratory class, it is often impossible for the instructor to give individual attention to each student. Through the use of photomicrographs all the students can be given an equal opportunity. These aids can be used by the instructor to point out to the class the various structures that should be observed. Another means of accomplishing this would be to provide each student with a small print on which the important structures were labeled.

Good results were obtained using a set of small prints in an embryology class as a means of aiding the students to find specific structures. Although each student had his own set of slides, all were not working on the same sections at the same time. The instructor, by using these prints, could quickly refer to a specific view under observation by a student.

Testing. Photomicrographs serve a very useful purpose in the testing program of a laboratory class. These photomicrographs can be used in any one of a number of ways, of which two are listed.

1. Prints which have had numbers substituted for the names of structures for identification. An enlarged print which could be viewed by the entire class could be used for this purpose. One advantage of using enlarged prints is that they can be used in a lighted room.
2. Transparencies or filmstrips can be projected and various structures pointed out for identification.

Summary

Although the teaching of laboratory classes in the biological sciences has been greatly aided by the use of charts, models, outline drawings and microscope slides, it is felt that photomicrographs are being overlooked.

The basic equipment needed for photomicrography is (1) a microscope, (2) a source of illumination, (3) filters, (4) a camera and (5) film.

Photomicrographs may be prepared for use as (1) photographic prints, (2) transparencies and (3) filmstrips. They may be used in any of the above forms for the purpose of testing, decreasing instruction time and stretching the supply of slides.

Some of the areas of zoology where photomicrographs could be used are: embryology, parasitology, histology and anatomy. Likewise they could be used in the areas of botany in plant anatomy, genetics and cytology.

Selected References

(1) Allen, R. M. *Photomicrography.* D. Van Nostrand Company, New York. 365 pp. Illus. 1941.
(2) Loveland, R. P. *Simplified Photomicrography with a Hand Camera.* Eastman Kodak Company, Rochester, New York.
(3) ———, Color Photomicrography in the Laboratory, *Anal. Chem.*, Vol. 21, p. 467, April, 1949.
(4) ———. *Photomicrography of Stained Slides with Kodachrome and Kodak Ektachrome Films.* Eastman Kodak Company, Rochester, New York.
(5) Dempster, W. T., Principles of Microscope Illumination and the Problem of Glare, *Jour. of the Optical Soc. of Amer.*, Vol. 34, No. 12, Dec. 1944.
(6) Richards, O. W. *The Effective Use and Proper Care of the Microscope.* American Optical Company, Buffalo, New York.
(7) *Kodak Films.* Eastman Kodak Company, Rochester, New York.
(8) *Kodachrome Films for Miniature and Movie Cameras.* Eastman Kodak Company, Rochester, New York.
(9) *Kodak Data Book on Slides.* Eastman Kodak Company, Rochester, New York.

Earlybird **Best Wishes for a Very Merry Christmas and a Happy New Year to all of you and yours from The Editorial Staff!** May there be just enough clouds in your teaching, research, and private life to make a beautiful sunset.

Notices of Editorial Board Meetings and Executive Board Sessions during **NABT'S Annual Convention at Boston, Mass., Dec. 27–31,** with AAAS and its other affiliated Teaching Societies, will appear in the complete program of AAAS and The Teaching Societies. NABT's own program appears in this issue.

A Modern Suite of Biology Rooms

IRVING C. KEENE, Brookline, Massachusetts, High School

The dream of a high school biology teacher came true! How many of us have hoped that we would sometime have the proper space and equipment to teach a real *living* course in biology, where pupils could learn by observing and doing! Surely textbooks are a necessary aid in teaching, but I happen to be a teacher who believes that high school pupils learn faster, show more interest, and retain more when they can deal with living plants and animals in as near their natural environments as possible. I am certain that, with a classroom, conservatory, animal room, and plant preparation room, biology pupils at Brookline High are doing just that.

When it came time to build a new gymnasium, our educational leaders saw to it that space on the 3rd floor was reserved for music, activities, photography, and a suite of biology rooms. I am most fortunate to teach in a school system where administrators believe that they should consult the classroom teacher for advice as to equipment and space needed to meet the needs of pupils. I had filled the old laboratory, where I had taught in the science wing, to overflowing with plants and animals. This greatly impressed school officials, and might give you an idea for bringing your needs and aims to the attention of your own officials. At least it was not long after that I was given "the green light," and started making plans and listing equipment needed.

FIG. 1. View of classroom.

During my 24 years of teaching biology, I had visited many high school biology laboratories, gathering ideas on their best features and equipment; school authorities gave me what I felt was needed. The photos here will help you visualize the suite of four roms which was provided.

FIG. 2. View of classroom looking out into conservatory.

The classroom shown in Figs. 1 and 2 is 40 ft. long and 25 ft. wide. The teacher's Lab. bench, from which the pictures were taken, has a soapstone top with gas and compressed air outlets. There are six drawers and three large compartments for storage. The outstanding feature in the bench is a built-in 30-gal. aquarium beside the sink; the teacher's platform and bench are elevated 8 in. above the level of the floor so that classroom demonstrations and the showing of specimens can be clearly seen by all. The teacher's desk is to the left of the Lab. bench and on the platform. 28 pupils can sit at movable Lab. benches. The left wall, Fig. 1, has museum, filing, and storage cabinets all set into the wall. Two shelves, running the length of the room above the cabinets, are ideal for our bird collection. There is a 3-ft. wide bench along the back of the room, above which is a tack-board. There are also two large tack-boards on either side of the two-section sliding blackboard. I am a great believer in tack-boards wherever possible in the classroom. The tack-board facing the pupils is labeled, "WHAT WE ARE NOW STUDYING IN BIOLOGY." The outstanding feature of the room is the glass partition that separates the classroom and the conservatory. Here the pupils can observe plants. They are always eager to get out into the conservatory before the class period begins. I am able, from my Lab. bench, to see everything

that goes on in both the conservatory and the plant preparation room. We are experimenting with various climbing plants to cut down some of the glaring light from entering the classroom; I do not believe in pulling down shades to block this view into the conservatory.

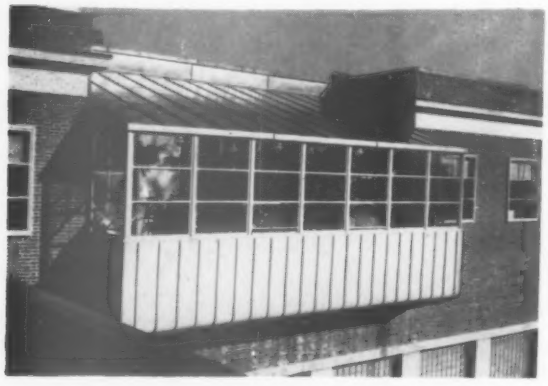


FIG. 3. Outside view of conservatory.

The conservatory, Fig. 3, overhangs 4 ft. from the side of the building. It is ventilated from the top and lower side windows. The conservatory is 30 ft. long and 14 ft. wide. Fig. 4 shows part of the interior and the entrance to the animal room. The plant benches are 3 ft. high and 3 ft. wide. There is a section reserved for plant germination and propagating work. A feature of the conservatory is the vivarium, called the "snake pit" by the

FIG. 4. Conservatory showing vivarium.

pupils. The floor graduates downward so that we are able to have sections of woodland, swamp, bog and water habitats with native turtles, frogs, salamanders, snakes, and fish to be observed and studied by pupils throughout the school year. Many of my pupils have received their first glimpse of many of these specimens here. Our "snake pit" is a center of attraction, especially at feeding time. I am able to get a fairly large class around the vivarium at one time.

The animal room, which leads off the conservatory, is 10 ft. 8 in. long, and 9 ft. 9 in. wide. Using cages placed on top of each other, we are able to keep a good supply of animals. There are grain bins beneath the soapstone tops. The tile floor has a drain in the middle of it so that the floor and walls can be washed. There is a ventilator for constant changing of the air in the room.

On the other side of the conservatory is the plant preparation room. It is 20 ft. 7 in. long and 9 ft. 9 in. wide. There are bins for loam, leaf mold, and sand beneath the bench on the left. There are four cabinets and four drawers in the room for storage, with a blackboard at the end of the room. Here pupils get training in planting, seed germination, propagating, potting, and general care of garden and house plants. Plant life, with these facilities, is much more interesting for my pupils than it was when studied mainly from a text book.

These are the main features of our suite of biology rooms. There are, of course, many things I have omitted. As NABT meets in Boston in December, and Brookline is only about seven miles away, I hope it will be possible for many of you to visit our school. I will be glad to show you around and explain how we are equipped *to teach a living course in high school biology.*

ANNOUNCEMENT

Music In Nature, a popular informal discussion of time, tone, tune, timbre, and touch in relationship to bird songs and animal sounds, and including over 50 bird songs and animal sounds, is again available on four 12-inch vinylite (non-breakable) phonograph records. Included are four calls of the California quail, songs and cries of the goldfinch, wolf, horned owl, tree toad, and meadowlark, ideally suited for all grade levels. The right to sell these excellent recordings by well-known and revered Dr. Loye Miller, Former Professor at Univ. of California, has been given to The Cooper Ornithological Club as a contribution to ornithology. The four discs, seven sides recorded, can be had for $7.50 plus 3% sales tax in California. Order from: Cooper Ornithological Club, c/o Dept. of Zoology, Univ. of California, Los Angeles 24, Calif.

A Fossil Story For Children

LOYE MILLER, Former Professor at University of California, Los Angeles

Editor's Note: This clever story, told as by a father to his child, can be read to elementary or junior high school pupils as motivation or as an introduction to a study of extinct animals. It offers excellent correlation for an English assignment; pupils may be encouraged to collect pictures of and prepare talks about the extinct animals mentioned in the story.

"Once a long time ago in 'Long Sangalus,' before there was any 'Long Sangalus,' before Daddy was a little boy even and there weren't any Indians yet—only just plains and swamps and wild beasts—there lived an Old Proud Peacock. He lived in the thickets around some water holes out on the plains south of the Santa Monica Mountains. Now peacocks are very proud and sometimes they think more about how they look than they ought to. They do have beautiful long tails, but they are a little bit *short* on every-day common sense.

"Well, one winter the rains didn't come as usual and the water holes began to get smaller and smaller until there wasn't enough water to run off in a stream, and the little pools that were left when the water didn't run off got all funny-looking and *smelled* very queer. The mud that was around them didn't look nor smell just as the mud used to when the little stream was bigger. There were some pools that seemed to get all black and sticky, with funny rainbow colors on top as bright as Old Proud Peacock's tail.

"Was that the 'asaphalt,' Daddy?"

"Yes, that was the 'asaphalt,' all gummy and sticky like tar. There wasn't any little stream to carry it off when it came up out of the cracks that ran away down deep into the ground, so it just stayed there and got more and more sticky in the sun and the wind until it was almost as bad as hundreds and hundreds of sticky flypapers all squdged into one piece and bigger than our whole sleeping veranda. In the daytime the dust would blow in and cover the asphalt all over so it looked like dry ground, but it *wasn't* dry ground! In the nighttime, when the water didn't dry up as fast as it trickled out of the bank, there would be some water on top of the asphalt all spread out so it looked like a nice water hole again in the morning.

"There was one Old Sore-Footed Wolf who lived in that same thicket. He was old and lame and couldn't run very fast, not fast enough to catch jackrabbits, so he used to eat lizards and quail eggs and gnaw the bones of the ground sloths that the saber-toothed tigers had killed. This Old Sore-Footed Wolf came limping and whimpering along through the dry weeds one morning and, what should he spy but the Old Proud Peacock, still thinking about his big fine tail as he walked out into a pool to take his morning drink! My, how he did wish he could catch that fine breakfast!

"Now, the Old Sore-Footed Wolf had tried any number of times to slip up on Old Proud Peacock, but he never could quite make it on three legs; still, he was never too lame or too discouraged to try. He just licked his chin to taste how hungry he was and started to slip along through the dry grass, holding up his sore foot. Of course Old Proud Peacock saw him before he really got through the bushes. But what do you 'spose? That funny-smelling mud had squdged up between Old Proud Peacock's toes and around his shins. It had just stuck him so fast that he couldn't pick up his feet at all and, when he flapped his wings, they got all smeared up. And his big fine tail, that he was so proud of, what a sight it was! It didn't look a bit nice all covered with 'asaphalt.'

"Well, the Old Sore-Footed Wolf got closer and closer. Old Proud Peacock acted so funny, he let out a great 'squa-a-awk!' just as if a snake had caught him. The Old Sore-Footed Wolf just couldn't stand it any longer. Skip-zim-blam! He landed right in the midst of the pool, grabbed Old Proud Peacock in his mouth, and started to wade ashore on his three good legs. Well, sir! But he just couldn't *wade* ashore. He was stuck in the awful 'asaphalt'! It felt just as if a snake had gotten him by all three legs at one time and, when he put down the other leg, that got

—Courtesy: Carnegie Museum, Pittsburgh, Pa.

La Brea Tar Pits, Rancho La Brea, California

This photo of a reproduction of the famous La Brea Tar Pits, now set aside as Hancock Park in the City of Los Angeles, shows a bison (*Bison antiquus*) which has been chased by three dire wolves (*Canis dirus*) and has become mired in the tar. Two great saber-toothed cats (*Smilodon californicus*), attracted by the commotion, have driven the wolves away. In a nearby tree, a giant vulture (*Teratornis merriami*)—largest known extinct bird of flight—is waiting to share in the feast. The tree is the Macnab cypress (*Cupressus macnabiana*) which, although found fossilized in the tar, still exists in parts of California. A ground squirrel (*Citellus beecheyi*), and a yellow-billed magpie (*Pica nuttalli*), look on. Both of these animal species still live in California, but all of the other animals became extinct long ago. The bubbles are caused by gases escaping through the tar.

caught too, and there he was. He yapped and he howled and he made such a noise that a little Wolf Pup, who had started out to hunt his own breakfast, thought that his old three-legged uncle had caught something at last and would need him to help eat it. He scampered up, waggling his tail, and plumped into the pool to get a bite. What a row there was now! Old Sore-Footed Wolf felt mad enough to fight anything, and he turned on that Wolf Pup and really made him howl. They raised such a row that they waked up all the other wolves in the neighborhood. They all came blundering into the pool, thinking the fight was over something good to eat. Wow! What a racket they made!

"Then Big Old Saber-Toothed Tiger pricked up his ears when he heard all that noise, and he came down there to drive away the wolves that were carrying on as though they had killed a buffalo, or a camel, or a ground sloth, or something. The Old Saber-Toothed Tiger thought that, if they had, he was going to take it away from them and eat the best part himself. So down he came with his big saber-teeth sticking half a foot out of his jaws. He gave a big 'gur-rowl' and plunked down among the wolves with a roar that would scare you and me almost to death if we heard it. But those wolves didn't run a bit—'cause they *couldn't!*

"Big Old Saber-Toothed Tiger was just as mad as he could be. He tried to pick up a paw to cuff the nearest wolf, but he could not pick it up. Then he tried to pick up another paw, but that one wouldn't come up either. He was stuck in the awful 'asaphalt.' Then he lifted up his voice, and *that* wasn't stuck a bit. I suppose you could have heard the noise he made 'way over in Hollywood even when there wasn't any Hollywood there!

"Well, they began fighting each other because each one thought the other one had hold of him. They didn't know any better than to fight about it, so they kept on fighting until there just wasn't any more fight left in them.

"Well now, you know, all this time there was an Old Turkey Buzzard watching them from way, way up in the sky. He had a notion there was something going to happen, so he circled 'round and 'round up there looking about as big as a housefly. He got so interested that he came down until he looked as big as a bumble bee. When he did that, another Old Turkey Buzzard—so far away you couldn't see him at all—happened to see the first Old Turkey Buzzard circle down until he looked as big as a bumble bee, and thought he had better come down too and look into the matter. And another Old Turkey Buzzard saw the second Old Turkey Buzzard, and here he came. So, by the time the first Old Turkey Buzzard looked as big as a butterfly, there were almost a dozen Old Turkey Buzzards circling 'round and coming closer and closer.

"But, by the time the first Old Turkey Buzzard looked as big as a mocking bird, there was a Big California Condor sailing along and, you know, he was as big as three Turkey Buzzards. He came right in ahead of the Old Turkey Buzzards, and they scattered out of his way. The Big California Condor came so close that he looked almost as big as a barn door flying about, because Condors are the biggest birds in the world except the ostriches.

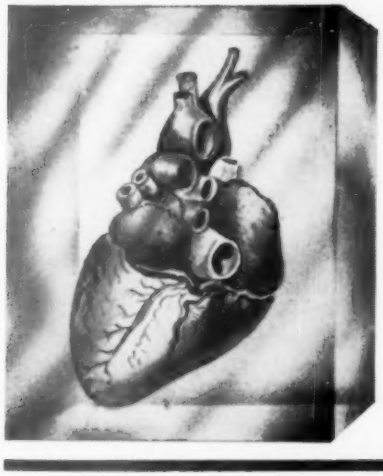
"Now, what do you suppose! Before the Old California Condor got one bite of that nice, delectable, dead Saber-Toothed Tiger that he wanted so much, what should appear in the sky but a great, great, great big *Teratornis!* Wow! He was a big fellow—so big, he looked like the whole barn flying along. *Teratornis,* you know, was the big bird Daddy found in the 'asaphalt' that's twice as big as a condor and bigger than any bird anybody ever saw flying about, and there aren't any birds living anywhere in the world nowadays that look anything like him. Daddy named him *Teratornis* because that means *terrible monstrous bird.* I suspect he must have looked almost like an airplane gliding in.

"Well, sir, that Old Terrible Monstrous *Teratornis* scattered the California Condor and the Old Turkey Buzzards out of the way like flies, and bang! he came down into the pool to get a bite of that delectable, dead Saber-Toothed Tiger for *his* breakfast. You *know* just what happened! He stepped right into the sticky 'asaphalt'! It didn't do him any good to flap his big wings, because the very first flap got them so smeared up that he couldn't flap but once more, and then his tail got stuck also.

"Well, sir! Do you know, it wasn't long until the Old California Condor, and his mate too, had done the same thing? Now those Old Turkey Buzzards, sailing around and down until they looked as big as pigeons, saw everything all quiet. So farther down they came, circling and circling until they got so hungry and greedy looking at all the good things for Turkey Buzzards to eat, that . . . ."

(Here the teacher may suggest that pupils complete the unfinished story as a life science–English assignment.)

PLASTICAST FOR PERMANENT PRESERVATION OF BIOLOGICAL SPECIMENS



PLASTICAST is a transparent clear liquid plastic (refractive index, 1.5). All forms of biological life, sections or whole small creatures, as well as organs, can easily and quickly be PRESERVED FOREVER without deteriorating simply by imbedding in PLASTICAST! *The entire process is as easy as pouring water out of a glass and takes less than 30 minutes!* A few drops of catalyst are added to the liquid plastic before imbedding. Ideal for biological work of all kinds. Price per gallon (including catalyst and complete directions), postpaid $19.50

Trial pint (including catalyst), postpaid .... $ 3.00

PLASTICAST COMPANY

P. O. BOX 987, Dept. 13 PALO ALTO, CALIF.

A SPECIAL MESSAGE TO YOU!

Here is your program for the Boston 1953 Annual NABT Convention. We like it. We think you will like it, too! And, well you should. It is yours all the way.

We began it last February with a questionnaire sent to 150 of you in 48 states. Remember it? Your response was terrific. From the results of that questionnaire we drafted the program, using your suggestions for both topics and speakers. Speakers and resource persons will come to serve you from 11 states.

The program for Monday afternoon is loaded with talent on the theme, "Human Conservation." Dr. Scholz comes to us highly recommended as a real authority on Antibiotics. Dr. Higgins, a prolific lecturer and writer, is a dynamic speaker who knows the problems of narcotics addiction from the side where it hurts. Mr. McCarthy has been in the thick of writing, research, and administration in the internationally famous School of Alcohol Studies, Yale University. And the panel is the best in talent and balance. Mr. Hamlin, representing administration on the state level, is ably supported by persons from university, high school, and law enforcement areas.

Tuesday is "Your Problem" day, planned so that you will sit in small groups with skilled resource persons to help with your own individual problems in a wide variety of areas. For those of you that will not know just which of these interesting work groups you want to participate in, don't worry. Just choose one, for at the close you will get a full report on all of them. These groups will be keynoted by two of New York's leading Science Educators, Dr. Tanzer and Mr. Eisman, who for several years have been conducting noteworthy research in the much neglected area of "Biology for the General Student."

Thanks for your cooperation. I'll see you in Boston!

ARTHUR J. BAKER, *President-Elect*

1953 ANNUAL CONVENTION PROGRAM

of the

National Association of Biology Teachers

Hotel Bradford—Boston, Massachusetts

(all sessions in The Reception Room unless otherwise indicated)

Sunday—December 27

9:30 to 11:30 A.M.

Oval Room. NABT Conservation Project: **Outstanding Techniques and Programs in Conservation Education.** DR. R. L. WEAVER, Project Leader, *presiding.*

1:30 to 3:30 P.M.

Joint Session on The Teaching of Science and Mathematics. Symposium: **The Next Generation of Young Scientists and Their Science Teachers.** MORRIS MEISTER, Bronx H.S. of Science, *presiding.*

The Harvard Conference on Nationwide Problems in Science Teaching, FLETCHER G. WATSON, Harvard University.

A Single-track Program for the Schools.

A Double-track Program for the Schools, HUGH TEMPLETON.

6:00 to 8:00 P.M.

Lobby Salon. **Banquet of The Science Teaching Societies.** C. RUSSELL MASON, Executive Director, Mass. Audubon Society, *presiding.*

9:30 to 11:30 P.M.

Lobby Salon. **All-Societies Mixer.** Square dancing and social hour.

Monday—December 28

8:00 to 9:30 A.M.

Drawing Room. **Executive Board Meeting**

8:30 to 9:30 A.M.

Lobby Salon. **Showing of Science Teaching Films.**

9:30 to 11:30 A.M.

Joint Session: NABT, NSTA, ANSS, and AAAS Cooperative Committee, **New Developments from Research into Resources of the Land.** CHARLOTTE L. GRANT, Oak Park H.S., Ill., *presiding.*

Petroleum Products. WARREN K. LEWIS, Dept. of Chem. Engineering, Mass. Inst. of Technology.

Forest Products.

Food from the Land. RAY KOON AND STAFF, Mass. Field Station, Waltham.

Minerals from the Land. A. A. LAWRENCE, Boston Sales Mgr., Dow Chemical Co., Midland, Mich.

12:30 to 1:30 P.M.

NABT Luncheon. Address: **Understanding the Principles of Biology.** JOHN T. BONNER, Prof. of Botany, Princeton University.

2:00 to 2:40 P.M.

NABT Session—Theme: **"Human Conservation,"** MALCOLM CAMPBELL, Pres., New England Biological Ass'n, *presiding.*

Recent Discoveries in Antibiotics

DR. DALE SCHOLZ, M.D., Medical Director, Heyden Chemical Corp., New York, N. Y.

(Ten minute question period included in time.)

2:40 to 3:20 P.M.

Status of Drug Addiction in the United States

DR. LOIS HIGGINS, Director, Crime Prevention Bureau, Chicago, Ill.

(Ten minute question period included in time.)

3:20 to 3:50 P.M.

Status of Alcohol Addiction in the United States

MR. RAYMOND G. MCCARTHY, Associate Director, School of Alcohol Studies, Yale University, New Haven, Conn.

(Ten minute question period included in time.)

3:50 to 4:30 P.M.

Panel: *How to Effectively Present a Unit on Alcohol, Narcotics, and Tobacco*

Chairman—MR. HOWARD E. HAMLIN, Supervisor, Health and Narcotics Education, State Dept. of Education, Columbus, Ohio.

DR. LOIS HIGGINS, Director, Crime Prevention Bureau, Chicago, Ill.

MR. RAYMOND G. MCCARTHY, Associate Director, School of Alcohol Studies, Yale University, New Haven, Conn.

MISS EDITH M. MATTESON, Instructor of Health, Hartford Public High School, Hartford, Conn.

8:00 to 9:00 P.M.

Drawing Room. **Executive Board Meeting**

9:00 to 10:00 P.M.

Conference Room. **Editorial Staff Meeting**

Health Committee Sessions

Membership Committee Sessions

Other Committee Sessions As Announced

Tuesday—December 29

8:00 to 9:30 A.M.

Drawing Room. **Executive Board Meeting**

8:30 to 9:30 A.M.

Lobby Salon. **Showing of Science Teaching Films.**

9:30 to 11:30 A.M.

Lobby Salon. Topic: **New Developments from Research into Water.** DR. LEO F. HADSALL, *presiding.*

Water in Industry. E. W. BOEHNE, Mass. Inst. of Technology.

Foods from Water. GEORGE HAMPTON, Vice Pres., General Foods Corp.

Minerals from Water. A. A. LAWRENCE.

2:00 to 2:30 P.M.

NABT Session—Theme: **"Your Biology Classroom Problems,"** MR. ARTHUR J. BAKER, *presiding.*

Introduction of speakers, followed by group work, with each audience member choosing an interest area with a pre-appointed Chairman-Recorder and several resource persons. The Chairman of each group, following the group work, will report back to the entire audience.

Biology for the General Student

MR. LOUIS EISMAN, Chairman, Science Department, Andrew Jackson High School, St. Albans, N. Y.

DR. CHARLES TANZER, Chairman, Science Department, Seward Park High School, New York, N. Y.

2:30 to 2:35 P.M.

Organization of Group Work by MR. BAKER, *presiding officer.*

2:35 to 3:25 P.M.

Group Work on the following topics:

The Use of Visual Aids in the Biology Class. Problem 1

Chairman—DR. ROBERT GERING, Research Ecologist, Dugway Proving Grounds, Tooele, Utah

DR. EMERY WILL, Professor, State Teachers College, Oneonta, N. Y.

MRS. MURIEL BEUSCHLEIN, Professor, Chicago Teachers College, Chicago, Ill.

Animals in the Biology Laboratory. Problem 2

Chairman—SISTER GABRIELLE, O.S.F., Saint Francis Academy, Pittsburgh, Pa.

MR. PAUL WEBSTER, Instructor of Biology, Bryan City High School, Bryan, Ohio

MR. JOHN WOOLEVER, Head, Science Department, Mumford High School, Detroit, Mich.

MRS. LIELA BAAS, Instructor of Biology, Maine Township High School, Des Plaines, Ill.

The Use of the School Garden, Greenhouse and Plants in the Biology Class. Problem 3

Chairman—SISTER CLARETTA, Instructor of Biology, Trinity High School, River Forest, Ill.

MR. DENNIS BAPST, Instructor of Biology, Community High School, Blue Island, Ill.

The School Forest. Problem 4

Chairman—DR. RICHARD WEAVER, Professor of Natural Resources, University of Michigan, Ann Arbor, Mich.

MISS LOLA LEMON, Instructor of Biology, Gary Public High School, Gary, Ind.

Biology Clubs and Project Work. Problem 5

Chairman—DR. D. F. MILLER, Head, Department of Zoology and Entomology, The Ohio State University, Columbus, Ohio

MR. REX CONYERS, Head, Department of Science, University High School, University City, Mo.

MR. ROBERT SMITH, Biology Instructor, DeKalb Township High School, DeKalb, Ill.

MR. LEE R. YOTHERS, Head, Science Department, Rahway High School, Rahway, N. J.

Biology Field Trips. Problem 6

Chairman—Dr. E. Laurence Palmer, Director, Education Committee, National Wildlife Federation; Professor Emeritus, Cornell University, Ithaca, N. Y.

Dr. Leo Hadsall, Professor of Zoology, Fresno State College, Fresno, Calif.

The Place of the Textbook in the Broad Biology Problem. Problem 7

Chairman—B. Bernarr Vance, Head, Science Department, Daniel Kiser High School, Dayton, Ohio; Associate Professor of Biology and Education, The University of Dayton.

Miss Ruth Dodge, Science Instructor, Emma Willard School, Troy, N. Y.

Mr. James Otto, Head, Science Department, George Washington High School, Indianapolis, Ind.

(*Continued on Page 223*)

"HOW I DID IT"

To make it easier to continue our study of leaves when the autumn season is past, and to

make our collection of leaves permanent, we have tried the following processes:

1. Rosin

To keep the colors and to preserve entire branches of autumn leaves for room decoration, we used crushed rosin and an old fashioned iron. We heated the iron, applied it over the crushed rosin, and then pressed both sides of the leaf. This coated and dried the leaf, and prevented it from curling. The stems may be lacquered or painted for preservation.

2. Blueprints

We purchased some blueprint paper from an art supply store, and had some pieces of glass cut as large as our sheets of paper—8″ by 11½″. On a sunny day we placed the leaves on the blueprint paper and pressed them down with the glass. To get a sharp outline, contact between the leaf, the glass, and the paper must be very close to prevent the light from getting under the leaf. After exposing them to the sun until a sharp outline was produced, we proceeded to develop them by immersing them into a pan of water to which a few crystals of potassium dichromate were added.

3. Ozalid or Helios Prints

At an art supply store, we procured various colors of Ozalid or Helios prints. These are trade names for prints that are developed with ammonia fumes. The process for getting a sharp outline was identical with the one we had used for the blueprints with the exception that, instead of using water for developing, we used ammonia fumes from a bottle of ammonium hydroxide. The paper was held over the bottle and moved over the entire area until the leaves became dark in color. An easier and maybe more practical way with younger students would be to moisten a piece of cotton with ammonia water, and place it in the bottom of a large jar. Roll the exposed print and insert it into the jar. Keep the jar well closed until the leaf print becomes dark in color.

4. Paint Prints

We secured some oil paint from the art class, thinned it, and spread it on a glass. With a thin brush, we painted the under side of the leaves. The painted leaves were then inverted onto a clean sheet of paper. With another paper over the leaf, we ran our fingers over the leaf until each vein was imprinted on the bottom paper. Several copies may be made with just one painting. The colored leaves made attractive borders and good study specimens for our leaf collection booklets.

Sister M. Gabrielle, O.S.F.,
St. Francis Academy,
Pittsburgh 34, Pa.

The Use of *Drosophila Melanogaster* in High School Genetics

ANDREAS A. PALOUMPIS, High School, Mason City, Illinois

Certain genetic principles can be taught at the high school level more effectively if the class discussions are accompanied by laboratory work. In teaching a unit in genetics the instructor has the problem of selecting the type of plant or animal to use in the laboratory. Controlled crossing of plants is not practical because of seasonal aspects. Even if the high school has greenhouse facilities, the time element again makes the crossing of plants inadvisable. Hamsters, rabbits, and white mice are good for breeding experiments, but the period of gestation, the available space, and the time consumed in keeping the animals clean makes the use of such animals impractical for high school use.

The fruit fly is ideally suited for high school laboratory crossing experiments because of the small amount of space needed, the short life cycle, and cleanliness. The 14-day life cycle allows a class to make several crosses within six to eight weeks. The transmitted characters, illustrating certain genetic principles, may be discerned by examining the flies with the naked eye.

Students working with fruit flies in the laboratory.

Materials Used in the Experiments

Three strains of fruit flies are used by the writer for the experiments in the laboratory. The first type used is referred to as the wild-type strain. The visible characteristics of this strain are red eye color, long wings, and gray body color. All three of the above-mentioned characteristics exhibit complete dominance. The second strain has vestigial wings, and the third strain has ebony body color.

Pure strains of fruit flies may be obtained from most biological supply houses at reasonable prices. Many strains are available and may be used with equal success. The flies should be used within two weeks after receiving them from the supply house. Only one bottle of each pure strain need be ordered. Culturing of the pure strain by the students will produce more than enough flies to complete the unit.

The following materials are needed in preparing the culture medium:

1. Three pure strains of *Drosophila melanogaster*
2. Agar-agar
3. Corn meal (yellow corn meal may be used)
4. Bre'r Rabbit molasses
5. Karo corn syrup
6. Water
7. Pan for boiling the medium
8. Bottles–250 cc. (The bottles must be able to withstand heat; each group of two students will require eight bottles.)
9. Paper toweling cut into strips $2'' \times 5''$
10. Cotton batting
11. Pressure cooker (or stove oven)
12. One cake of yeast
13. Ether
14. Small camel hair brush
15. Gummed labels

Preparing the Medium

The culture preparations available are many and varied. The writer has used a medium recommended by Dr. C. B. Bridges, California Institute of Technology, in Turtox Service Leaflet No. 15, General Biological Supply House, Chicago, Illinois. This medium is easy to prepare and the results obtained are favorable. The formula is:

40 grams agar-agar
200 grams corn meal (yellow corn meal may be used)

140 cc.	Bre'r Rabbit molasses
140 cc.	Karo corn syrup
2000 cc.	Water

The agar-agar is added to the water and brought to a boil. The corn meal is added slowly, stirring continuously. When well mixed, the Bre'r Rabbit molasses and the Karo corn syrup are added and the mixture is allowed to boil slowly for ten minutes. Enough of the warm cooked medium is poured into the bottles to fill them to a depth of one inch. A strip of paper toweling is placed in each bottle while the medium is still warm. The paper serves as a place for the larvae to pupate. The bottles containing the medium and paper are stoppered with cotton batting.

The sterilization of the bottles and medium often poses a problem for the high school laboratory which may not have an autoclave. The writer successfully substitutes a pressure cooker for an autoclave. The cooker is filled to a depth of one inch of tap water and the bottles are placed upright in the cooker. The cooker is heated and maintained at 15 pounds pressure for 20 minutes. If a pressure cooker is not available, favorable sterilization may be obtained by placing the bottles containing the medium in a kitchen oven for two hours at 150° F.

The prepared medium usually begins to sour within two or three weeks. When this occurs the medium should be discarded. If sourness occurs during an experiment, the flies must be transferred to a bottle containing fresh medium.

Characters for Separating the Males and the Females

The adult male and female flies can be distinguished from each other by several differences. The tip of the abdomen of the female is pointed, whereas the abdomen of the male is rounded. The tip of the abdomen of the male is solid black in color, whereas the abdomen of the female is striped (Figs. 1 and 2).

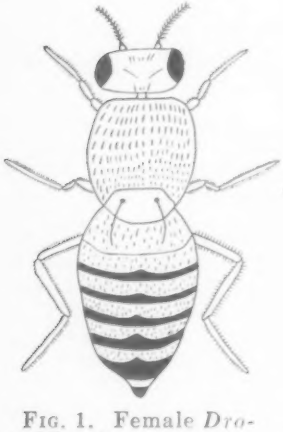


FIG. 1. Female *Drosophila* minus wings.

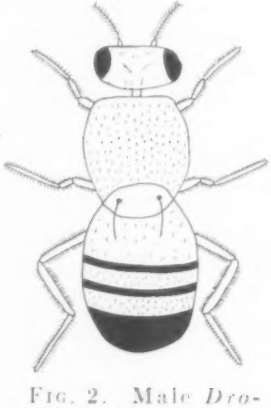


FIG. 2. Male *Drosophila* minus wings.

Preparing the Medium for Crossing

One-quarter cake of yeast is dissolved in 250 cc. of tap water. One drop of this solution is added to each sterilized bottle within 24 hours or less before the flies are introduced.

Method of Handling Adult Flies

About ten or 12 adult flies are transferred from the pure strain bottle (as received from the supply house) to a clean bottle. In transferring the flies, merely invert the mouth of the pure strain bottle over the clean bottle and tap the pure strain bottle until the flies move into the clean bottle. When the transfer is completed, put two or three drops of ether on cotton and place it into the clean bottle. When the flies appear incapacitated, place them on a piece of white paper. The flies will remain immobile for about five minutes. Never expose the flies to the ether for more than one minute. A small camel hair brush, moistened by dipping it into a glass of water, makes the handling of adult flies easy.

Selecting Virgin Females for the First Experiment

Virgin long-winged females are needed for the crossings. Virgin long-winged females are obtained by carefully removing ten or twelve pupae with a pair of forceps from the wild-type pure strain bottle. The pupae are deposited immediately into a fresh culture bottle. The bottle should be labeled properly with the type of strain and the date the larvae were placed in the bottle. Check the bottle each morning. Flies that have emerged during the night are released. During the day examine the bottle every four hours. The flies that emerge during the four-hour period are the ones used for selecting virgin females. These virgin females are used in making the monohybrid cross discussed later.

First Experiment (Monohybrid Crosses)

Each group of two students is given a labeled culture bottle containing one long-winged virgin female and one vestigial-winged male as selected above. The students write their names on the label and place the culture

bottles containing the flies on a shelf or table in the laboratory. A week after the cross has been made, the parent flies are removed from the bottle to prevent breeding of the parents and the offspring.

Within the next four days emergence of the adult flies begins. These adult flies are the F_1 generation of a cross between a virgin long-winged female and a vestigial-winged male. The students transfer the flies from the culture bottle to the etherizing bottle. The etherized F_1 flies are placed on a piece of white paper and examined for the wing character. All of the flies examined should exhibit the long-winged character of the female parent.

It is not necessary to culture virgin females for the F_2 cross. Each group of students selects one etherized female and one male and places them into a newly prepared culture bottle. Within ten days after the F_2 cross is made the parent flies are removed and treated in the same manner as described above.

The progeny of the F_2 generation exhibit a ratio of approximately three long-winged flies to one vestigial-winged fly. This is obtained by the students counting and recording the number of long-winged flies present. These findings are coordinated with the class discussion.

The monohybrid cross can be repeated, using a long-winged male and a vestigial-winged female. The F_2 progeny of this cross demonstrate that the sex of the flies has no marked effect upon the results of the matings. The 3:1 ratio also can be demonstrated by mating a gray-body-colored male with an ebony-body-colored virgin female.

Second Experiment (Dihybrid Crosses)

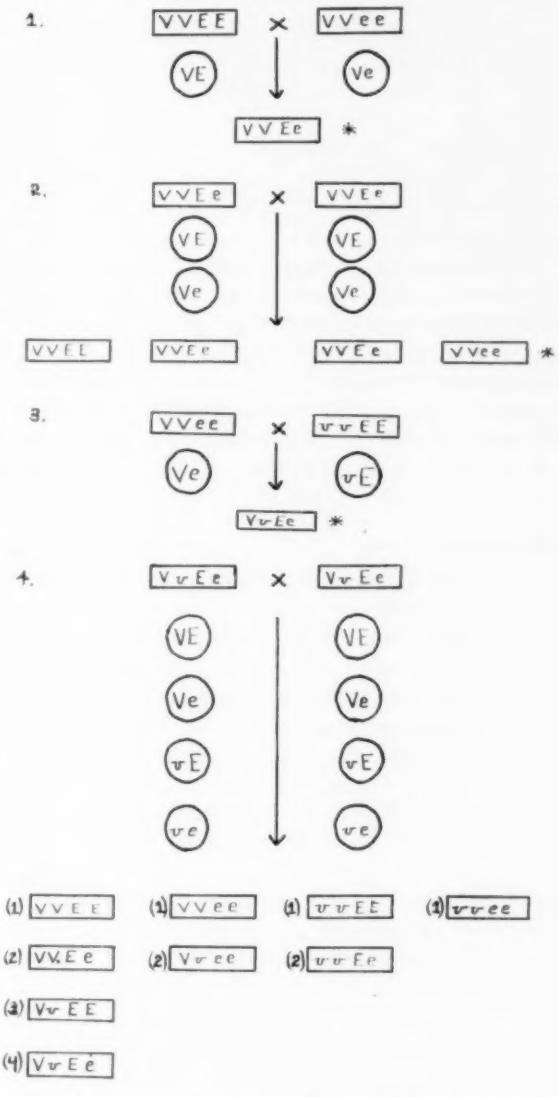
The general procedure of crossing and handling the flies in the first experiment is used in the second experiment. Each group of two students prepares a culture bottle containing a long-winged, gray-body-colored virgin female and a long-winged, ebony-body-colored male. The culture bottle is labeled and set aside as described above. A week after the cross has been made the parent flies are removed from the bottle and within another four days the emergence of the adult flies begins.

The progeny of the cross between the long-winged, gray-body-colored virgin female and long-winged, ebony-body-colored male are transferred to a clean bottle and etherized. All flies examined should exhibit the long-winged, gray-body-color characters of the female parent.

DIHYBRID CROSS

V = Long Wings **E = Gray Body Color**
v = Vestigial Wings **e = Ebony Body Color**

Note: The individuals to be used in the succeeding cross are marked with asterisks (*).



Each group selects one etherized female and one male and places them into a newly prepared culture bottle. Within ten days after the second cross is made the parent flies are removed and the culture bottles are watched for the emergence of the adult flies. The adult flies are transferred to a clean bottle, etherized, sorted, and counted. Approximately three-fourths of the progeny of

the second cross will exhibit long-winged, gray-body-color and one fourth will exhibit long-winged, ebony-body-color.

An etherized, long-winged, ebony-body-colored male is placed in a fresh culture bottle containing a vestigial-winged, gray-body-colored female. Within ten days after the third cross is made the parents are removed. When the adult flies emerge they are etherized and examined.

The progeny of this cross should exhibit long-wings and gray-body-color. One male and one female long-winged, gray-body-colored flies are placed in a fresh culture bottle. The parents are removed ten days after the cross is made. When the adult flies emerge, they are transferred to a clean bottle and etherized.

The progeny of this fourth cross exhibit a ratio of approximately nine-sixteenths long-winged, gray-body-colored flies; three-sixteenths long-winged, ebony-body-colored flies; three-sixteenths vestigial-winged, gray-body-colored flies; and one-sixteenth vestigial-winged, ebony-body-colored flies (Fig. 3). These findings are coordinated with the class discussion.

Discussion

The writer spends six to eight weeks on the unit, depending upon the speed of his class. The laboratory work is interspersed with class discussions. Usually five one-hour class periods are devoted to mitosis and meiosis, prior to beginning any of the laboratory work. After the virgin female culture is started, the writer begins class discussions of simple crosses, with particular emphasis on the cross being carried out in the laboratory.

While the dihybrid cross is developing, most of the class periods are spent discussing the broader aspects of genetics, such as hybrid corn, human genetics, and animal breeding. The writer believes that from such a unit on genetics the students obtain an invaluable knowledge of genetics in everyday life.

Suggested References

1. Demerec, M., and B. P. Kaufman. 1950. *Drosophila Guide.* Carnegie Inst. of Washington, 44 pp.
2. Sinnott, Edmund W., L. C. Dunn, and Th. Dobzhansky. 1950. *Principles of Genetics.* McGraw-Hill Book Company, 505 pp.
3. Turtox, General Biological Supply House. *The Culture of Drosophila Flies and Their Use in Demonstrating Mendel's Laws of Heredity.* Turtox Service Leaflet, No. 15, 4 pp.

Across The Editor's Desk

Discovery of a **potent new antibiotic,** called **tetracycline,** has been announced recently. The discovery fulfills a prediction that valuable new weapons against diseases could result from a determination of the chemical structure of terramycin, accomplished in 1952. Tetracycline has proven active against microorganisms linked with such diseases as bronchial pneumonia and "strep" sore throat, in laboratory tests, and appears to parallel the activity of terramycin against germs associated with typhoid fever, boils, and urinary tract infections.

Seeds of *Mimosa pudica*, the **"sensitive plant,"** obtainable from several supply houses or gathered from wild plants in some southern states, will germinate and grow in a warm room. These interesting plants can be used in the lecture room or laboratory to strikingly demonstrate responses by plants to heat and touch. My students also grow them at home as "conservation pieces," and for unique gifts.

Energetic and capable NABT member and former Managing Editor, **Irving C. Keene,** invites all of you to visit his new and modern suite of biology rooms at **Brookline High School** during NABT's Annual Convention in Boston, or any other time you are in that area. Irving's school is only seven miles from Boston; his article in this issue describes his unique and outstanding facilities, and includes an invitation to you.

Robert R. Finlay, Supervisor of Conservation Education, State Dept. of Education, Columbus 15, O., wants illustrated written descriptions of outstanding teaching techniques and practices in all phases of Conservation from Ohio teachers for the report of **NABT's National Conservation Project** in cooperation with The American Nature Ass'n. Contact Bob if you would like further information, or send him your material.

The number of Americans afflicted with cancer appears to be increasing yearly, and a majority of all having advanced stages of cancer die from it despite approved medical efforts. Many in the field of cancer research and control feel that we should give more attention to making young people aware of recognized and suspected **causes of cancer.** Reference materials for such class discussions, special reports, and projects appears in *A Methodology for Environmental and Occupational Cancer Surveys,* Pub. Health Tech. Monograph No. 1, U. S. Gov't Printing Office, Washington 25, D. C.; also in literature from Cancer Prevention, Inc.,

1928 North Ave., Bridgeport 4, Conn., and American Cancer Society, Inc., 130 E. 66th St., New York 21, N. Y.

Success in producing sucrose (common table sugar) by chemical synthesis—the "Mt. Everest" of carbohydrate biochemistry—has been reported by **Dr. Raymond Lemieux** and **Dr. George Huber** of The Canadian Nat'l Research Council. As to the immediate commercial use of sugar synthesis, however, Dr. Henry Hass, Chemist-President of The Sugar Research Foundation, comments: "It is as unlikely as some real estate agency having Mt. Everest cut up into lots and sold for development!" The process is now quite expensive, and sugar produced by green plants is comparatively cheap. However, the knowledge promises to make the synthesis of many complicated biochemical substances easy routine. In connection with their experiments, Dr. Lemieux and Dr. Huber were also able to synthesize maltose and trehalose.

Radioactive penicillin-G has been prepared by "feeding" the penicillin-producing mold a compound which includes radioactive carbon-14.

A new compound which has a "relatively high activity against tuberculosis in mice," called **thioisonicotinamide** and a chemical relative of the T B drug isoniazid, has been derived from tobacco.

International Friendship League, 40 Mt. Vernon St., Boston, Mass., has hundreds of teacher-sponsored letters from boys and girls in all countries of the free world. Most of these are written in English, and the writers are eager for pen-friends in the United States. Life science teachers and their pupils can exchange specimens, secure information and enjoyment firsthand, practice communication, make lasting and interesting friendships, and help promote international understandings through exchange letters and packages with these boys and girls in foreign countries. The League is endorsed by NEA, U. S. Office of Education, and the State Department, and sponsored by many foreign Ministries of Education.

Single copies of the following recent **conservation teaching aids** can be had free from Forest Service, U. S. Dept. of Agriculture, Washington 25, D. C.: *Suggestions for Integrating Forestry in the Modern Curriculum; The Big Three—Water, Grass, and Trees* (playlet for children); *How Man Starts New Forests; Forest Insects and Diseases; Materials to Help Teach Forest Conservation* (a new source list); *Forest Service Films* (a listing of films available on loan for educational purposes to schools, civic groups, churches, television studios, etc.); *Suggested Questions for a High School Conservation Quiz; What the Forester Does for Wildlife.*

Your Editor has belatedly learned that staunch and active NABT member, **Dr. James M. Sanders,** Chicago Teachers College, was recently elected **President of NABT Affiliate, THE CHICAGO BIOLOGY ROUND TABLE,** succeeding **Ruby Fremont.** Why doesn't someone tell me these things earlier! Dr. Sanders also presented to this fine group an official NABT Affiliation Certificate earlier this year.

Our **Dr. C. W. Lantz** was Chairman of The General Committee for **"The Fourth Annual Midwest College Conservation Education Conference."** NABT members **Matala, Weaver, Fowler, Milliken, Smith, Whittaker, Bender, Beuschlein,** and others served as leaders or resource persons on the Conference Program.

Be sure to take advantage of the column, **"To Serve The Busy Biologist and The Cooperative Advertiser,"** in this and the November issues. Please **be sure to mention** *The American Biology Teacher* when answering individual advertisements, and **be sure to place your orders for equipment and supplies with the fine firms and individuals who advertise in our Journal.**

Will someone volunteer to head a committee to furnish direct help to **beginning teachers of biology,** and **to those first attempting to organize and teach life science in the elementary grades?** Perhaps a special column can be started in the Journal, or a separate bulletin service offered. If you have ideas on this, please contact any NABT officer or member of The Editorial Staff (complete list in the November issue).

LETTERS

Dear Editor:

I am in full agreement with Woolever's article, "Animals and Why Children Fear Them," but I feel that it doesn't go far enough. Do we not need an article by a psychiatrist to remind us of the best ways to overcome fear? I feel that we don't know the methods well, but the following are possible steps:

1. Provide correct knowledge to replace fear due to ignorance.
   a. The snake is not slimy, etc.
2. Know the hazards involved in handling the animal. The "tame" deer which is eating out of one's hand may become impatient and strike with its sharp hoof. Germs may cause illness; so always wash hands before eating, before leaving toilet, etc.
3. Provide pleasurable experiences with the animals feared. Let the child see his classmates enjoying handling, touching, and talking about the specimen.
4. Get the child to talk and write about his fear and how it started, if he can recall.
5. Know what to do.
   a. Put on a leather glove before handling the bat, chipmunk, rat, etc.

b. Stop the car. Let the bee go to a window, which can be opened to let her out.

c. If he is close enough to see the shape of the rattlesnake's iris or the pit back of the nostril, the beginner is too close.

d. If one is going into rattlesnake territory, go properly dressed and carry a snake bite kit. Know how to use the kit.

Sincerely,

S. M. Pattee

Dear Mr. Harrold:

Please renew my membership. I certainly have enjoyed being a member for the past year. Had I known the value of membership in The National Association of Biology Teachers, I would have entered it long ago. I am one of the lucky recipients of a Ford Foundation Fellowship for 1953–1954 and shall be away to study and travel much of the time, but shall look forward to reading my copies of the Journal at times when I return home. . . . I am Head of The Science Department in our high school, but my teaching is all in biology. I have been able to convince my Principal that biology should be taught to everyone in our high school, so we allow our pupils to elect either academic or general (practical) biology. . . . I shall appreciate any material on this phase of biology teaching this coming year.

James S. Ritter,
83 Aircobra St., Bristol, Pa.

Editor's Note: Mr. Ritter has been asked to tell of his subject matter organization and teaching techniques in a future article.

Biology Laboratories

By: "The Old Fossil," at Wells High School, Chicago

Biology Laboratories dies with this issue. The Old Fossil, 15 years ago, was first President of NABT. He, with Alex Herskowitz as Editor and about three dozen other biologists, met in New York City, formulated the organization and constitution, and founded *The American Biology Teacher*. TOF guest-edited three special issues of the Journal. Shortly after this John Breukelman, then Editor, and TOF conceived the idea for this column. It had no specific format. It just grew. The monicker, "The Old Fossil," was used to fill space. It stuck. *Biology Laboratories* had a similar ontological experience. Our new Editor Vance wishes to enhance this evolution by having you **suggest a new name for this column.** Please help us. See the November 1953 issue for details.

Early winter is often an excellent time to collect toadstools and mushrooms. After a series of rains, they may come up in profusion. They reappear under similar circumstances again in the spring. Many years ago TOF had one specimen brought into the laboratory that was so large it would not fit into a bushel basket. Puff balls may be collected in summer. Look in grain fields a few weeks after harvest. Another fungus, corn smut, may be collected in late July.

If you visited your state fair this year, you perhaps saw an animal-training act by **Jorgensen Christensen.** Years ago he toured the continent of Europe with 90 horses. Today his act is much smaller. However, the palomino horse and burro, which are part of the act, are often on short rations for timothy hay. Timothy hay is a good feed for horses. Farmers do not have horses on their farms any more; consequently they do not raise timothy for hay. Last year Mr. Christensen had an opportunity to take his act into Canada. In his act was a Brahma bull, a black sheep, and a goat. They could not return to the United States because of the hoof-and-mouth disease. The animals were not infected, but the border was closed for all movement of cloven-hoofed animals to the South.

Here are two new occupations of interest to biologists. Dairy organizations have men who devote their entire time to artificial insemination. A farmer may purchase the service for his herd, from most any herd in the United States, Canada, or South America. The second occupation is herd-testing for production. One tester services about 30 herds. The tester comes to the barn of the farmer once a month at both milkings on that day. He weighs the milk and tests it for each cow. At the end of the year the farmer has an accurate check on every critter in his herd. A low-producing cow eats as much as a high-producer. The low-producers are sold and replaced by promising young heifers. Several paraplegics do this kind of work.

Rabbit hutches or animal cages may be made quickly. One-inch mesh chicken wire or quarter-inch hardware cloth may serve to line the box to be used. Lettuce crates or orange boxes make excellent frames. A nest made from a smaller box should be placed inside for the animal to hide, when it prefers not to be disturbed. Newspaper may be used for a dropping board. The latter should be changed frequently to avoid odors in the class room.

The January issue will have an article by "The Old Fossil," in place of **Biology Laboratories.** It will be titled "Biology in Deutschland," same fossilized style. TOF was honored by a visit from a Deutschland biology Professor and lecturer recently. The Chicago Board of Education office referred the Professor to Wells High School and TOF. The article will give this Professor's reactions to biology in the United States, and what biologists are doing in Western Germany.

HYDROPONICS — NEW TECHNIQUES

BROTHER G. NICHOLAS, F.S.C., La Salle High School, Cumberland, Maryland

You will recall Brother Nicholas for his article last year in *ABT* on "Cave Biology" and in May, 1953, *The Scientific Monthly* on "Recent Paleontological Discoveries from Cumberland Bone Cave." He is a member of the Board of Governors of the National Speleological Society; and last summer was engaged in work with the Bone Cave fossils, carried on at the Carnegie Museum, Pittsburgh, and aided by a grant from the Western Maryland Railway.

One of the more outstanding student projects completed at La Salle High School this year was a scientific study of the growth of rose blossoms, using a water culture method. The student, Frank Fleckenstein, with assistance from his father, the author, and various references, worked out a technique which can be used with either small containers or large tanks. The growing solution for the experiment required four liters of distilled water, with the following chemicals:

Potassium phosphate	0.61 gm./liter
Calcium nitrate	2.124 gm./liter
Magnesium sulphate	1.1 gm./liter
Trace solution	3.75 cc./liter

The importance of minute quantities of the trace elements may be determined since, without them, the plant would die. The trace solution contains the following in one liter of water:

Manganese sulphate	1.0 gm.
Boric acid	1.5 gm.
Copper sulphate	0.5 gm.
Zinc sulphate	0.5 gm.

The record of some difficulties encountered in developing a worthwhile procedure may be an effective caution against any impulses to look for "short-cuts" from the method finally evolved. Originally, Mason quart jars were equipped with flat corks which were wedged in the mouth of the jar. A slit was cut into the cork so that the young plant could be slipped into the cork and held in place by cotton lightly packed into the slit. This slit had to be wide enough to accommodate the stem when it matured. The cork was then put in place, and the plant was adjusted so that the roots were partially submerged in the nutrient solution. Since the air was soon out of the solution, the roots grew near the top of the jar where small traces of air diffused. Changing the solution daily required considerable labor and was rather wasteful.

The method finally used was originally developed by Dr. J. W. Shive at the New Jersey Experimental Station and was modified slightly to permit a minimum amount of equipment. Dr. Shive found that, if a fine stream of air was forced into the bottom of the jar, the roots distributed themselves uniformly through the solution and made a much better growth. This required less changing of the nutrient solution and made it possible to grow fully developed plants. The fine stream of air was obtained by the *Shive constant drip method* of continuous flow of the nutrient solution. In the culture jar a thistle tube is inserted through the cork so that the stem is within a half inch of the bottom. The solution is then conducted from a reservoir, which is set above the culture jar, into a funnel by means of a capillary tube (0.6 mm. bore) so bent that it serves as a siphon. The solution

Note rose blossom and length of stem in right hand of Frank Fleckenstein. Reservoir jar on box, culture jar in middle, overflow jar to left.

then drips into the funnel, and each drop traps and forces ahead of itself a large bubble of air. An alternate method is to have the reservoir consist of another jar which is inverted in a finger bowl with the siphon so bent that one end may be placed under the edge of the inverted jar. This arrangement may be made more attractive by using colored glass jars. In addition a U-shaped, 2-mm. bore siphon may be inserted into the culture jar with the free end draining into another container.

Let us compare hydroponics with soil culture. More plants can be crowded into a given area for soil culture than in water culture. In water culture there is a smaller rooting area, although the tops have to be spread out more, whereas in soil there is a greater rooting area and the plants are grown upright. The greatest factor affecting yield in soil is the amount of nutrient material present. Even greenhouse growers have not appreciated the fact that to obtain large yields frequent fertilization is essential. Below is a table showing the parts per million in a balanced solution and those in good soil:

Ion in the nutrient solution	Parts per million	
	Balanced solution	Good soil
Calcium	360	1,000
Nitrate	1,116	500
Ammonium	252.2	100
Magnesium	108	100
Sulphur	144	50
Potassium	175	200
Phosphorus	140	60
Boron	1	1
Manganese	1	5
Iron	1	5

Although the proportion of the calcium to the other ions is somewhat different in the soil than in the nutrient solution, it is all dissolved in the solution whereas in the soil the amount of replaceable calcium is measured. Just how much of this is in solution at any one time is a question which cannot be answered by generalization. Probably calcium, as well as other minerals in the soil, is only partly available to the plants. It would be possible to make a nutrient solution that would be comparable to the soil in all elements except possibly calcium. This might not be necessary since good plants can be expected with rather wide variations in the proportion of elements.

Chemical culture growers must also check the sweetness or sourness of the growing medium; soil in one case, sand, cinders, or water in the other. This is so important that a very precise language and method of measurement has been devised. The terms "sweet" and "sour" have been replaced by the terms "acidity" and "alkalinity" or, more correctly, "relative acidity"; thus it is more exact to measure the degree of relative acidity by use of pH. Most greenhouse plants are adapted to a pH of 4–6.[1] The bottles shown in the lower right hand corner of the illustration are those used to measure pH by the colorimetric method, which depends upon the use of a dye which is capable of showing a range of shades, or even changes in color, in harmony with differences in the relative acidity of the material to be tested. This measurement of pH by the use of indicators, as these dyes are termed, can be simplified by using a universal indicator, which is a mixture of indicators covering a wider pH range than each individual one. One of the most common universal indicators is the following solution:

Methyl orange	.1	gm.
Methyl red	.4	gm.
Bromthymol blue	.4	gm.
α-Naptholphthalein	.32	gm.
Phenolphthalein	.5	gm.
Cresolphthalein	1.6	gm.
70% Ethyl alcohol	100.0	cc.

One drop in 10 cc. of test solution gives the following colors for the respective pH values:

Color	pH
Red	3.0
Orange-red	4.0
Yellow-orange	5.0
Yellow	6.5
Green	8.0
Bluish-green	9.0
Blue	10.0
Violet	11.0
Reddish-violet	12.0

One precaution that must be observed is to place a cover over the roots when they are exposed to direct sunlight; otherwise they will be destroyed. An overflow jar should be connected to the culture jar by a piece of glass tubing to drain off the excess solution. The solution in the culture jar gradually increases as a result of the continuous flow method.

[1] The pH values for individual plants are given in Turner, Wayne, and Henry, *Growing Plants in Nutrient Solution*, John Wiley and Sons, N. Y.

The above experiment can be readily set up with a minimum amount of material. It can serve as a dynamic example of hydroponics, the importance of trace elements, and even the role of various chemicals in plant metabolism.

A *YOUR* MAN TEACHES BIOLOGY

The word *the* occurs with considerable frequency in the language of most English-speaking persons. Mr. B. has lost the word from his vocabulary. Mr. B. is my cadet teacher this year, but next year he will have a position of his own. Perhaps the case is similar to that of Van Dyke's character. The result is Mr. B.'s case is not so pathetic; that is, not to Mr. B. But to the students the effect is at times amusing, at times confusing, at times embarrassing. After several yards and rods of omissions, the matter becomes exasperating.

It isn't, I suppose, that we care so greatly for a *the*. Like air, we do not miss it until it is cut off. At first when there is still oxygen, but less oxygen, we get along very well. It is only when someone presses his hand hand against *your* throat that you struggle for air. (I intentionally use *your* here.)

This *your* man makes me writhe. As I have said, he has no *the* in his vocabulary. Perhaps to him the word *your* seems warm, and bold, and intimate. So it often turns out, for Mr. B. teaches biology. He explains, "*Your* pine tree has *your* excurrent shape, for *your* trunk is straight and *your* limbs branch at right angles." Later, he picks up a pine cone and explains, "*Your* ovaries are placed here on *your* scales." He discusses Conservations as follows: "*Your* trees help to conserve *your* water. They aid in lowering *your* temperature by increasing *your* evaporation." And more and more of this . . . .

I wish Mr. B. taught Finance!

HELEN FIELD WATSON,
Mitchell, S. Dakota

Elementary science teachers could do well to try some or all of the following: have an abundance of house plants in the class room; encourage pupils to bring in specimens of insects, flowers, and leaves; have pupils examine seeds, for food storage areas and embryos; make collections of common local fauna and flora; make leaf scatter-prints for special displays; grow seedlings in glass jars against moist blotting paper; plant a small spring garden. Many of the specimens can be used to start a class museum, on a shelf in the room, a window sill, or in a cabinet. **Elementary science teachers** could do well to make a seed collection of plants grown in the area. They should be air-dried first. After seeds are dry, they may be stored in any type container. An attractive label for each type is essential. Seeds should not be subjected to extremes of temperature, if they are to germinate later.

Books For Busy Biologists

KINSEY, ALFRED C., POMEROY, W. B., MARTIN, C. E., GEBHARD, P. H., and ASSOCIATES. *Sexual Behavior in the Human Female*. W. B. Saunders Co., Philadelphia, Pa. 842 pp. 151 charts. 179 tables. illus. 1953. $8.00.

This much-publicized report on female sex life by a capable, courageous, authoritative, persistent, and thorough research and teaching biologist and his associates is disappointing scientifically in many ways. Dr. Kinsey, senior author, seems surprised over some of the data obtained, and not at all certain that the 5940 highly selected and often atypical females, whose interviews were used, represent a valid cross-section of American women. His conclusions occasionally seem drawn from personal opinions rather than strictly from the data obtained, and the book clearly does not attain the scientific stature of his previous report on American men. It is, however, an excellent treatise on the biological aspects of human sex life and its mammalian origins. The book should prove a valuable aid to teachers, parents, and counselors in developing a better understanding of the biological backgrounds and significance of many sex or sex-associated problems among young people today, and in dealing with young people's problems in general; also in dispelling many misconceptions about the sex life of humans with at least the nearest to the truth obtained by anyone thus far.

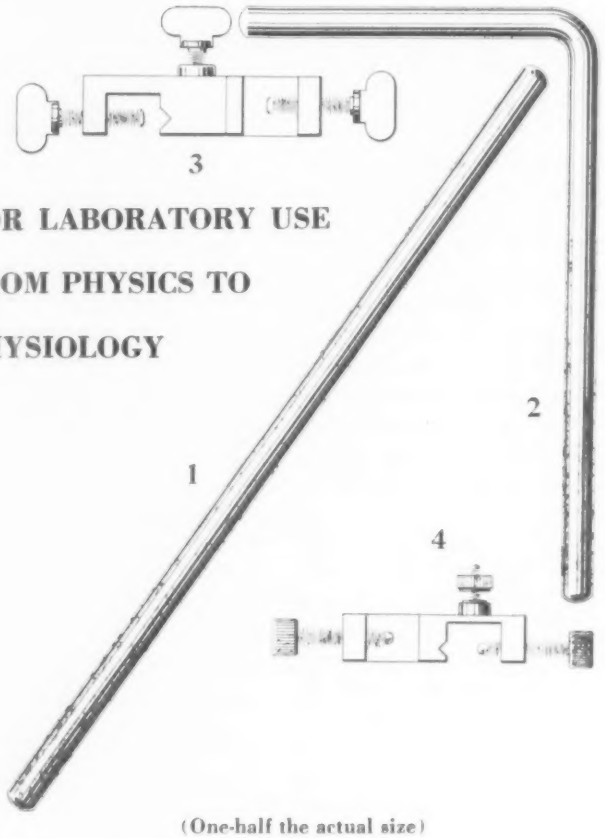
THE EDITOR-IN-CHIEF

KASTON, B. J. *How To Know The Spiders*. 1st ed. Wm. C. Brown Company, Dubuque, Iowa. vi + 220 pp. illus. 1953. $2.25.

Including sections on collecting, preserving and studying spiders, and a selected bibliography, this beautifully illustrated book considers 40 families, 190 genera, and 271 species of spiders. The large family Micryphantidae is mentioned only briefly because these spiders are seen infrequently by the casual observer. An excellent pictured glossary and helpful geographical ranges are included. The keys and descriptions are conveniently short and standardized; in some instances almost excessively so. The keys permit identification of most families and genera with little difficulty. This book will serve as a particularly valuable and long-needed introduction to the spiders.

ROBERT L. GERING,
University of Utah,
Tooele, Utah

RODS and CLAMPS



FOR LABORATORY USE

FROM PHYSICS TO

PHYSIOLOGY

(One-half the actual size)

1. *8-MM. Mounting Rod.* A strong, highly finished extension or support. 60¢.
2. *Right-Angle Rod.* Rigid and precisely formed, for universal adjustment of position. $1.10.
3. *Swivel Clamp.* The swivel gives complete rotation. Also to be had with jaws at 90°. Made, like 1 and 2, of nickeled brass. $5.00.
4. *Clamp with Binding-Post.* Our regular double clamp with binding screw added for quick wiring operations. Stainless steel, with nickeled brass fittings. The accurately machined jaws will take diameters of 14 mm. to 1 mm. $1.35.

We make also a *Heavy Clamp* without swivel, ¾ inch capacity ($2.50); as well as *Tunnel* ($8.00) and *Microflow* ($6.00) Clamps, for infusion regulation.

Write for the Catalogue and Price List

The* HARVARD APPARATUS COMPANY, *Incorporated

Dover, Massachusetts

(Organized on a non-profit basis for the advancement of teaching and investigation in physiology and allied sciences)

(*Continued from Page 212*)

3:35 to 4:10 P.M.

Reports of Chairmen of Group Work

Problem 1—3:35 to 3:40
Problem 2—3:40 to 3:45
Problem 3—3:45 to 3:50
Problem 4—3:50 to 3:55
Problem 5—3:55 to 4:00
Problem 6—4:00 to 4:05
Problem 7—4:05 to 4:10

8:00 to 9:00 P.M.

Drawing Room. **Executive Board Meeting**

9:00 to 10:00 P.M.

Conference Room. **Editorial Staff Meeting**
Committee Sessions As Announced

Wednesday—December 30

8:00 to 9:00 A.M.

Conference Room. **Joint Meeting of Officers of The Teaching Societies,** and other interested persons, to plan the 1954 Convention Program.

9:30 A.M. to 5:00 P.M.

Field Trip. The Teaching Societies.

Thursday—December 31

Start of NABT Conservation Project, **Workshop in Conservation Education,** 6 sessions, to process National Report. DR. R. L. WEAVER, *presiding.*

HOTELS AND APPROXIMATE RATES

Note: All of the following hotels, regardless of their zones, are either within a short walking distance of each other and of the Mechanics Building (the location of the AAAS Main Registration, Visible Directory of Registrants, the Exposition, the AAAS Science Theatre, and NABT sessions)—or can quickly and inexpensively be reached by subway or taxi.

HOTEL	ADDRESS	SINGLES	TWINS
	Downtown Hotels (near Common)		
Bradford (400)	275 Tremont St.	$4.50– 7.50	$ 9.00–12.00
Statler (1,300)	Park Square	5.00–10.00	11.00–16.00
Parker House (700)	60 School St.	5.00– 8.00	10.00–14.00
Touraine (200)	62 Boylston St.	5.00– 8.00	8.50–12.00
	Copley Square Hotels		
Copley Square	47 Huntington Ave.	4.00– 7.00	7.00– 9.00
Lenox (175)	Exeter St.	4.50– 5.50	9.00
Sheraton Plaza (500)	Copley Square	5.85 up	11.00 up
Vendome (300)	160 Commonwealth Ave.	4.50– 6.00	8.00–11.00
	Backbay Hotels		
Kenmore (400)	Kenmore Square	5.00– 8.50	9.00–12.50
Somerset (525)	400 Commonwealth Ave.	5.00– 9.00	12.00–14.00

Note: Some of the above hotels can supply:

1. Dormitory accommodations (five or more) at $2.75. These may be of particular interest to graduate students.
2. Rooms with running water but without private baths—at lower rates.

Most hotels can add a comfortable rollaway bed to any room for $2.50 or $2.75.

Biology in the News

How Long You Live May Depend on Where You Live, Louise Levitas, *Colliers,* Nov. 13, 1953, pp. 92–97.

How medical geographers discover what factors affect the health of peoples in different regions of the world, and assist the medical profession in the prevention of disease and death; includes useful maps on the leading causes of death, and offers clues as to why certain diseases are more prevalent in some regions.

The New Veterinarian, Lawrence Lader, *Coronet,* November 1953, pp. 150–154.

The new veterinarian uses everything from antibiotics to airplanes to serve his animal patients. This article may inspire another animal lover to become a veterinarian.

The Great Sperm Whale, *Life,* Nov. 2, 1953, pp. 118–124.

Some extraordinary pictures of the sperm whale, by Hans Hass.

A Silver Anniversary for Walt and Mickey, *Life,* Nov. 2, 1953, pp. 82–90.

A pictorial account of some of the work necessary to produce the Walt Disney films on animal life. Several excellent animal pictures are included.

The Machine That Helps Them Live Again, Milton Silverman, *Sat. Ev. Post,* Oct. 31, 1953, pp. 36; 166–170.

Medical men are devising more and better instruments for accurate diagnosis. Students may wish to learn about the *electromyograph,* which aids in determining what muscles may function again after serious injury to their nerve supply.

The Animals Have It On Us, Ivan T. Sanderson, *Sat. Ev. Post,* Oct. 24, 1953, pp. 30; 150–154.

An account of animal activities in avoiding enemies, protecting themselves against storms and other types of bad weather, and attracting mates. Apparently, the strange instinctive powers of animals indicate that they have the use of more than the usually considered five senses.

To Serve
The Busy Biologist
The Cooperative Advertiser

Recognizing the pressure of your duties and knowing your interests in the products our advertisers have to offer in the field of biology, you need only put checks on the squares below, sign the coupon and mail it to Muriel Beuschlein, Mgr. Ed., 6431 S. Richmond St., Chicago 29, Illinois.

☐ Bausch and Lomb Co.	*information*
☐ Arthur T. Brice – Films	*literature*
☐ John Q. Burch, Pub.	*information*
☐ Carolina Biological	*publication*
☐ Connecticut Valley Bio.	*catalog*
☐ Denoyer-Geppert Co.	*catalog*
☐ Exakta Camera Co.	*Booklet "I"*
☐ Feiereisen, Publisher	*information*
☐ General Bio. Supply Co.	*publication*
☐ Harvard Apparatus	*price list*
☐ D. C. Heath	*information*
☐ E. G. Hoffman and Son	*list*
☐ International Films	*catalog, guides*
☐ Marine Bio. Laboratory	*catalog*
☐ Mosby Co., Pub.	*price list*
☐ New York Scientific	*catalog*
☐ Pierce Book Co.	*catalog*
☐ Plasticast	*information*
☐ Quivera Specialities Co.	*catalog*
☐ Shorey Book Co.	*directory*
☐ Testa Mfg. Co.	*literature*
☐ Triarch – Geo. T. Conant	*catalog #10*
☐ Visual Sciences	*information*
☐ Ward's Natural Science	*animal chart*
☐ W. M. Welch Scientific Co.	*literature*

(Please Print)

Name .....

Position .....

School Address .....

.....

Bio-Buy-Lines

MARINE BIOLOGICAL LABORATORY

Complete stock of living and preserved materials for Zoology, Botany, and Embryology including Protozoan cultures, and Microscope slides.

Catalogues on request
Address Supply Department
MARINE BIOLOGICAL LABORATORY
WOODS HOLE, MASS.

Biological Supply Catalog and Current Live Reptile List free to teachers. Quivira Specialties Topeka 59, Kansas.

CONNECTICUT VALLEY SUPPLY CO.
LIVING & PRESERVED BIOLOGICAL MATERIALS
Write for our new catalogue
89 Kent Road Springfield 8, Mass.

BOOKS on Birds, Mammals, Natural History Subjects. New or out-of-print. Catalog sent on request. Pierce Book Company, Winthrop, Iowa.

LIVE FROGS & TURTLES
from
Wisconsin's oldest & largest frog dealer.
E. G. HOFFMAN & SON
P. O. Box 815 - Oshkosh, Wis.

BACK NUMBERS

Most issues of the American Biology Teacher, except those of 1938–39 and 1939–40, are available.

The contents of previous issues of *The American Biology Teacher* can be found by consulting the *Education Index* in your library.

Dear Editor Vance:

Stealing time to . . . skim the cream (of which there was a thick layer) from the most recent issue of our Journal just at hand . . . . Please do not discontinue "The Old Fossil" column. I enjoy and profit from this greatly. Please continue your alert practices which are making ABT the stimulating journal we need . . . . We are moving ahead and abreast of the times . . . . We must create the desire on the part of teachers to pick up every issue and look it over. . . . We cannot fail to interest the teacher with our present jam-packed utility. Nelson's "Opportunities . . ." will be worth its weight in gold with my students. . . . Keep on personalizing the Journal. The new Ward's Bulletins are excellent. . . . We are moving ahead! I just had to stop and tell you so.

CHARLES E. PACKARD,
Assoc. Prof. of Biology,
Randolph-Macon College

Index for Volume 15

Annual Convention Program for 1953, 210
Abbott, Cyril E., *Caracoles at Vinales*, 49
Across The Editor's Desk, 160, 183, 216
Activities by the Pupils of S. M. Pattee, 29
Agersborg, Helmer P. K., *The Importance of Comparative Histology in Education*, 69
Animals and Why Children Fear Them, John D. Woolever, 122
Association Officers and Editorial Staff, 192
Baker, Arthur J., *So This Is an "Air Fern"?* 101; *The Open Road to Education For Family Living*, 62
Baker, Howard, *Enzymatic Aid for Euglena*, 154
Barrows, E. F., *Food-Chain Culture of Daphnia*, 149
Benton, Allen H., *The Use of Balsa Wood in the Preparation of Skins of Small Mammals*, 148
Beuschlein, Muriel, *Free and Inexpensive Materials for Conservation Education*, 35
Biggs, Norman L., *Photomicrographs as a Laboratory Teaching Aid in the Biological Sciences*, 201
Biology Clubs as Teaching Tools, Robert L. Smith, 186
Biology in The News, 17, 21, 54, 111, 134, 167, 193
Biology Laboratories, M. C. Lichtenwalter, 110, 165, 188, 218
Books Reviewed
Chester, K. Starr, *Variation, Immunity, and Breeding of Cultivated Plants*, 21
Eisman, Louis, and Tanzer Charles, *Biology and Human Progress*, 164
Fitzpatrick, Frederick L., and Bain, Thomas D., *Living Things*, 191
Gardiner, Mary S., *The Principles of General Biology*, 191
Grimm, William Carey, *The Shrubs of Pennsylvania*, 164
Hyman, Libbie Henrietta, *The Invertebrates: Acanthocephala, Aschelminthes, and Entoprocta—The Pseudocoelomate Bilateria*, 84
Jean, Frank C., Harrah, Ezra C., Herman, Fred L., and Powers, Samuel R., *Man and His Biological World*, 164
Jones, Arthur W., and Carpenter, John M., *Microtechnique. A Student's Guide to Slide Making*, 190
Kaston, B. J., *How To Know The Spiders*, 221
Kinsey, Alfred C., Pomeroy, W. B., Martin, C. E., Gebhard, P. H., and Associates, *Sexual Behavior in the Human Female*, 221
Mavor, James Watt, *General Biology*, 109
Moment, Gardner B., and Close, Helen V., *Foundations of Biology, A Laboratory Handbook*, 190
Moody, Paul Amos, *Introduction to Evolution*, 84
Pennak, Robert, *Fresh-Water Invertebrates of the United States*, 191
Preston, R. D., E.Sc., F.Inst.P., *The Molecular Architecture of Plant Cell Walls*, 164
Rogers, J. Speed, Hubbell, Theodore H., and Byers, C. Francis, *Man and The Biological World*, 191
Royle, Howard A., *Laboratory Exercises in Genetics*, 109
Vinal, William G., *The Outdoor Schoolroom for Outdoor Living*, 110
Welch, Paul S., *Limnology*, 21
Wichterman, Ralph, *The Biology of Paramecium*, 164
Bowman, George W., *An Easily Constructed Microprojector for Drawing Purposes*, 150
Brice, Arthur T., *On the Zernike Phase-Contrast Method of Microscopy*, 124
Burning the Underbrush, Samuel L. Meyer, 95
Caracoles at Vinales, Cyril E. Abbott, 49
Card Holder for the Opaque Projector, O. W. Neher, 128
Cat Skeleton-Viscera, M. C. Miller, 177
Classroom Procedures in General Biology, Elma W. McConnell, 15
Comparative Study of Objectives, Content, and Methodology of Introductory College Courses in Zoology, A, Louis Lutz, 76
Conservation Education, Free and Inexpensive Materials for, Muriel Beuschlein, 35
Conservation in the 83rd Congress, 48
Cooperative Committee of the American Association for the Advancement of Science, The, 66
Davis, Leonard R., *An Easily Constructed Microprojector for Drawing Purposes*, 150
Dodd, John D., *Science—A Modern Fountain for Youth*, 20
Drawings, The Use of in General Zoology, Raymond Greb, 18
Easily Constructed Microprojector for Drawing Purposes, An, Leonard R. Davis, George W. Bowman, 150
Ecology in Conservation, The, Howard H. Michaud, 72
Educational Packet, 48
Enzymatic Aid for Euglena, Howard Baker, 154

health result from heavy consumption of sugar in the United States. The evidence includes sweetened and soft drinks. The Association recommends that the sale of sweetened beverages and confections in schools be stopped as a direct help toward improving dental health of school children.

National Teacher Examinations will be given at 200 centers throughout the United States on Saturday, Feb. 13, 1954. Application forms and a bulletin of information, describing registration procedures and containing sample test questions, may be obtained from college officials, school superintendents, or directly from Educational Testing Service, Box 592, Princeton, N. J.

Worth quoting to your students: "It is technology that gives the extra things that count. Industrial technology provides the extra food on the table, the extra mile on the speedometer, the extra dollar in the wallet. It is the extra bushel in the barn, the extra suit in the closet, the extra diploma at commencement time. It is the extra hours of leisure, the extra years of health and life, the extra measure of security. We have now opened up a whole new stage for our national development, a stage on which the elements of the land and the people are augmented by a third dimension—the dimension of science . . . ." Excerpt from speech by **Henry B. du Pont** before Kinston, N. Carolina Chamber of Commerce.

The Illinois Society for Medical Research announces a contest restricted to high school students. Essays of 250 words on the topic, "Animal Experiments and My Health," may be submitted before midnight, March 30, to **Dr. N. R. Brewer,** 951 E. 58th St., Chicago 37, Ill. First prize is $25.00; second, $15.00; third, $5.00. Further information may be had from Dr. Brewer, **Dr. J. M. Sanders,** 6800 Stewart Ave., Chicago 21, Ill., or Nat'l Society for Medical Research, 208 N. Wells St., Shicago 6, Ill.

Dr. Earl R. Glenn, Fulbright Prof. of Educ. Research, will spend another year at Central Philippines University in Iloilo, one of the central islands. CPU specializes in elementary education, and Dr. Glenn assists teachers in defining investigations for M.A. Degrees. Greetings and best wishes, Dr. Glenn.

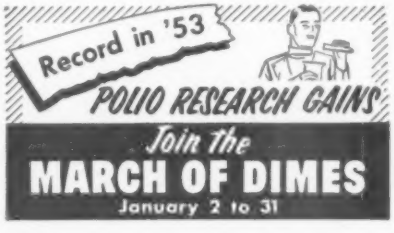
Who said this, and when? **"Nothing can better deserve your patronage than the promotion of science."** George Washington (1790)

Bro. H. Charles, St. Mary's College, Winona, Minn., contributor of *Biology In The News* and aggressive NABT and Editorial Staff Member, suggests that we should have "a book listing each especially active NABT member with personal data and a short summary of the activities and interests of each" for the guidance of new officers and Committee Chairmen. Send him your suggestions on this idea. **Would someone volunteer to compile such "a book"?**

American Cyanamid reports that the new antibiotic drug, **"tetracycline,"** is now on the market. The development of this new antibiotic is one of the most fascinating stories in the annals of modern medicine.

Just reported—through an error in hold-over copy for the Oct. 1953 issue, from the previous editorship, a letter printed at the bottom of Page 162 of that issue was from **Sister Mary Alverna** instead of Sister Mary Aquina.

Oxytocin, a hormone of the body's "master gland," the pituitary, **has been produced synthetically** by a team of biochemists led by **Dr. Vincent du Vigneaud,** Prof. of Biochemistry, Cornell Univ. Medical College. This is the first of the pituitary gland's vital secretions, which include ACTH, to be produced in the test tube, and the first polypeptid hormone to be produced synthetically. Oxytocin is the chief uterine-contracting and milk-releasing hormone of the pituitary gland. The synthetic product has the same physical and chemical properties as the natural compound, and demonstrates the same biological effects in experimental animals and clinical use.



Polio research made great gains in 1953. Don't forget **The March of Dimes,** Jan. 2–31.

If you could not attend NABT's thrilling Annual Convention at Boston, plan now for 1954.

NABT was ably represented at the "Resources for the Future" conference in Washington, D. C. Dec. 2–4 by **Weaver, Hadsall, Jeffers,** and **Palmer.** Plans were laid for joint action with other professional groups.

A new high honor and responsibility has been conferred on our versatile Mg. Editor, **Muriel Beuschlein,** recently chosen Chairman of a Local Area Conservation Study Project approved by The Steering Committee of the Illinois Curriculum Study group. **Dick Weaver,** Project Leader of NABT's Conservation Project, working with Illinois Chairman **Bob Smith** and Regional Chairman and NABT Pres. **Art Baker,** interested this group through preliminary meetings started last January. Congrats to Muriel, Dick, Bob, and Art for another major contribution.

You should read the complimentary letters that cross my desk each week on recent Journal improvements. Thanks to all of **you** who helped make these possible. **Let's move aggressively ahead to make ABT the top-ranking publication in its field!**

Film Showings at the AAAS, 97
Flightless Birds of New Zealand; Extinct and Near Extinct, Katherine V. W. Palmer, 103
Food-Chain Culture of Daphnia, E. F. Barrows, Eric Schwab, 149
Fossil Story For Children, A, Loye Miller, 207
Fowler, H. Seymour, *The Iowa Teacher's Conservation Camp*, 61
From the Retiring Editor, 155
Gabrielle, Sister M., *"How I Did It,"* 212
General Education Type of Biology Course, Sister Mary Aquin Miller, 51
Gering, Robert L., *Participative Visual Aids*, 93
Goddard, Charles A., *Try a Hydroponic Garden*, 12
Greb, Raymond, *The Use of Drawings in General Zoology*, 18
Growing Fern Prothallia, 65
Hadley, Charles E., *Living Damsel Fly Larvae as Supplementary Material for the Study of Insects*, 107
"How I Did It," Sister M. Gabrielle, 212
Huxley, Dr. Julian, *Wins Kalinge Award*, 149
Hydroponic Garden, Try A, Charles A. Goddard, 12
Hydroponics—New Techniques, Brother G. Nicholas, 219
Importance of Comparative Histology in Education, The, Helmer P. K. Agersborg, Ph.D., 69
Increase In Dues, 123
Inspiration Via The Disc, Robert Wheeler, 154
Iowa Teacher's Conservation Camp, The, H. Seymour Fowler, Dorothy M. Matala, 61
Kalinge Award, Dr. Julian Huxley Wins, 149
Keene, Irving C., *A Modern Suite of Biology Rooms*, 205
Key to Diagrams of Immature Eggs of Vertebrate and Invertebrate Animals Appearing in the March Issue, 100
Klinge, Paul, *The Superior Science Student in the Senior High School*, 129
Knowledges of Botany Possessed by High School and College Students, George G. Mallinson, 151
Letters, 14, 105, 133, 161, 184, 217
Levardsen, Norman O., *Photomicrographs as a Laboratory Teaching Aid in the Biological Sciences*, 201
Lichtenwalter, M. C., *Biology Laboratories*, 110 165, 188, 218
Living Damsel Fly Larvae as Supplementary Material for the Study of Insects, Charles E. Hadley, 107
Lutz, Louis, *A Comparative Study of Objectives, Content, and Methodology of Introductory College Courses in Zoology*, 76
Mallinson, George G., *Knowledges of Botany Possessed by High School and College Students*, 151
March of Dimes for 1953, 11
Matala, Dorothy M., *The Iowa Teacher's Camp*, 61
McConnell, Elma W., *Classroom Procedures in General Biology*, 15
Meyer, Samuel L., *Burning the Underbrush*, 95
Michaud, Howard H., *The Ecology in Conservation*, 72
Miller, Loye, *A Fossil Story For Children*, 207
Miller, M. C., *Cat Skeleton-Viscera*, 177
Miller, Sister Mary Aquin, *The General Education Type of Biology Course*, 51
Modern Suite of Biology Rooms, A, Irving C. Keene, 205
More Activities by the Pupils, S. M. Pattee, 29
National Membership Chairman, 182
Nature Trail at Roosevelt High School, 53
Neher, O. W., *Card Holder for the Opaque Projector*, 128
New Associate Editors, 159
New Editor-in-Chief, 132
New England Biological Association, 11
Nelson, H. C., *Opportunities for Employment in the Biological Sciences*, 180
New Officers, 15
New Publication Schedule, 48
Nicholas, Brother G., *Hydroponics—New Techniques*, 219
Nominating Committee Report, 158
Oliver, Margaret H., *The School Garden, an Outdoor Laboratory for Teaching*, 5
On the Zernike Phase-Contrast Method of Microscopy, Arthur T. Brice, 124
Open Road to Education for Family Living, The, Arthur J. Baker, 62
Opportunities for Employment in the Biological Sciences, H. C. Nelson, 180
Packard, Charles E., *A Simple Indication of the Efficacy of a Teaching Device*, 166
Palmer, Katherine V. W., *Flightless Birds of New Zealand; Extinct and Near Extinct*, 103
Paloumpis, Andreas A., *The Use of Drosophila Melanogaster in High School Genetics*, 213
Participative Visual Aids, Robert L. Gering, 93
Pattee, S. M., *More Activities by the Pupils*, 29
Petit, Lincoln, *A Guide for Teaching the Scientific Method*, 31
Photomicrographs as a Laboratory Teaching Aid in the Biological Sciences, Norman L. Biggs and Norman O. Levardsen, 201
President's Message, 161
Proposed Changes in Constitution, 159
Radio Transcriptions, 65
Regional Meeting With AIBS, 182
Relieving Anxiety and Fear of Animals in Children, John D. Woolever, 178
Sanders, J. M., and Committee, *Sources of Strip Films and Color Slides*, 184
School Garden, an Outdoor Laboratory For Teaching, Margaret H. Oliver, 5
Science, A Modern Fountain For Youth, John D. Dodd, 20
Scientific Method, A Guide for Teaching, Lincoln Petit, 31
Schwab, Eric, *Food-Chain Culture of Daphnia*, 149
Seashore, Down to the, Joan Woods, 8
Seashore Project Inshore, A, Erma Vance, 145

Simple Indication of the Efficacy of a Teaching Device, A, Charles E. Packard, 166
Smith, Robert L., *Biology Clubs as Teaching Tools*, 186
Some Educational Activities of the National Wildlife Federation, Walter P. Taylor, 81
So This Is an "Air Fern"? Arthur J. Baker, 101
Sources of Strip Films and Color Slides, J. M. Sanders and Committee, 184
St. Louis Meeting, 23
Superior Science Student in the Senior High School, The, Paul Klinge, 129
Taylor, Walter P., *Some Educational Activities of the National Wildlife Federation*, 81
Trees Along the Nature Trail at Roosevelt High School, 53
Use of Balsa Wood in the Preparation of Skins of Small Mammals, The, Allen H. Benton, 148
Use of Drosophila Melanogaster in High School Genetics, The, Andreas A. Paloumpis, 213
Vance, Erma, *A Seashore Project Inshore*, 145
Watson, Helen Field, *A "Your" Man Teaches Biology*, 221
Wheeler, Robert, *Inspiration Via the Disc*, 154
Why Should I Be a Member of NABT?, 182
Woods, Joan, *Down to the Seashore*, 8
Woolever, John D., *Animals and Why Children Fear Them*, 122
Woolever, John D., *Relieving Anxiety and Fear of Animals in Children*, 178
"Your" Man Teaches Biology, A, Helen Field Watson, 122

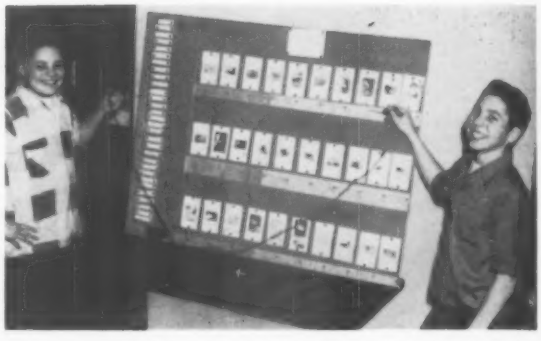
A Changeable Electric Bulletin Board

PAUL V. WEBSTER, City Schools, Bryan, Ohio

The electric bulletin board, which is already a well-known teaching aid, may be designed with some interesting innovations.

Our electric bulletin board has a shellaced plywood base, with strips of corkboard to which the pictures and names may be thumbtacked. The corkboard strips were made from scrap pieces of a bulletin board. The contact bolts and taps were placed under the pictures, and to the left of the names, in order to pierce only the plywood. When the circuit is completed between the name and the correct picture, a door buzzer sounds. The buzzer, which was toned down to avoid too much noise, had the bakelite shield replaced by a clear plastic cover made in a plastics class of the school. Thus the operation of the buzzer could be seen by the science students. A cheap transformer was used, eliminating the need for replacing dry cells. The two leads are radio test leads purchased at a local radio shop. The wires connecting the pictures to the names are extra long, so that they can be changed now and then to prevent mere memorization of a sequence pattern.

There is room for 30 small pictures and names. We have found this large enough to be challenging and not too large to be discouraging. An outstanding feature of this electric bulletin board is that it can be changed frequently. Each change constitutes a small project for a student. A change every two weeks provides enough time for the students to gain proficiency on a set this large, and for them to enjoy showing others how well they have conquered a set.



Contact! Dean Crutch, *left*, and John Hardy, *right*, proudly display the electric bulletin board they constructed.

Small pictures are pasted on the unruled side of $3'' \times 5''$ cards, and the correct names are written on the backs of the cards for filing purposes. The names for the board are printed or typewritten in capital letters on strips of heavy paper. When the two weeks are up, the cards of that particular set are placed in an envelope, labeled, and filed for use the next year. Larger pictures may be used, with arrows pointing to the corresponding contact bolts, if it is impossible to get ten of these larger pictures in one row across the board. Collections such as leaves, insects, sea shells, and twigs may be pinned to the board and identified similarly. This sort of identification is lacking in many of our biology textbooks, and the changeable electric bulletin board is one of the many aids which can be used to help meet this interest and need.

For EASIER, FASTER TEACHING . . . BETTER UNDERSTANDING

In today's overcrowded science classes these three low-cost visual aids give *every* student the full advantage of your instruction. Exclusive Bausch & Lomb features provide today's brightest, most detailed images...offer the widest range of practical use. Use them to help your students learn better . . . by helping them *see* better.

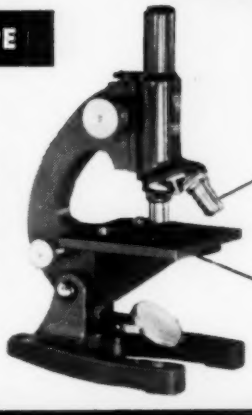
B&L MODEL LRM BALOPTICON PROJECTOR

Unequalled versatility. Projects large, clearly detailed images of slides *and* opaque objects, specimens, printed matter, photographs . . . your imagination sets its only limits! Catalog E-11.

Projects:
OPAQUE OBJECTS
SLIDES • BOOKS
SPECIMENS • CHARTS
PRINTED MATERIAL
PICTURES

B&L "FL" MICROSCOPE

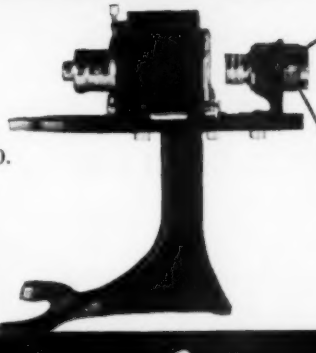
Full standard size throughout! Pre-focusing gage, saves time. Superb resolution, flat fields, with achromatically corrected 10X and 43X objectives. More teaching advantages than any other student microscope, at any price. Catalog D-185.



SEPARATE COARSE AND FINE FOCUSING
•
INTERCHANGEABLE ILLUMINATOR AND MIRROR

B&L TRIPLE-PURPOSE MICRO-PROJECTOR

Projects permanently mounted specimens, or live specimens in liquid—on screen, for class viewing, or directly on sketch pad for drawing or tracing. Catalog E-10.



Projects:
MOUNTED SPECIMENS
IMAGES for TRACING
LIVE SPECIMENS

WRITE for demonstration and literature. Bausch & Lomb Optical Co., 71824 St. Paul St., Rochester 2, N. Y.

Bausch & Lomb *Educational* **Instruments**

For utmost clarity . . .

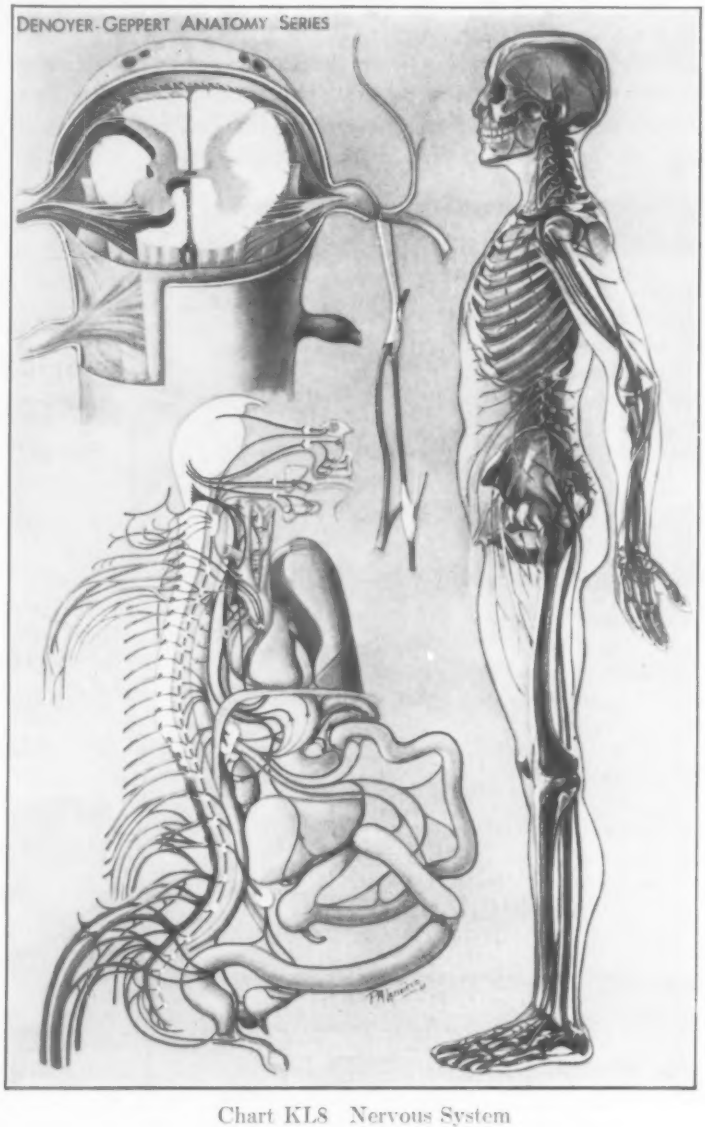


Chart KLS Nervous System

. . . in presentation of subjects in human anatomy and physiology, use the KAMPMEIER-LARIVIERE Functional Anatomy Charts, by

DENOYER-GEPPERT COMPANY

5241 Ravenswood Avenue **Chicago 40, Illinois**

For complete information on the Kampmeier-Lariviere Series, write for Booklet S38DABT.

SCIENCE FILMSTRIPS

BIOLOGY — CHEMISTRY

PHYSICS — MICROBIOLOGY

ATOMIC ENERGY

HOW TO STUDY

GENERAL SCIENCE

FIGURE DRAWING

LABORATORY SAFETY

HEALTH AND SAFETY (Campers)

SAFETY IN AN ATOMIC ATTACK

SCHOOL BUS SAFETY

WATER CONSERVATION

Ask for free folder and information about the new SCIENCE STRIPS in color for Elementary classes.

Made by Teachers for Teachers
Since 1931

VISUAL SCIENCES

Box 599-B — SUFFERN, N. Y.

TESTA MICROSCOPES

A DISTINGUISHED LINE OF AMERICAN-MADE, LOW-COST SCHOOL MICROSCOPES.

LABORATORY SIZE, WITH LARGE, PROFESSIONAL INCLINING STANDS, PRECISE INTERCHANGEABLE OPTICS.

INSTRUCTION MANUAL FURNISHED. QUANTITY DISCOUNTS TO SCHOOLS.

MODEL F—100 to 725X **$92.50**
Parfocal triple nosepiece. Condenser stage with iris diaphragm. Coarse and fine adjustment.

MODEL H—50 to 700X **$82.50**
Parfocal double nosepiece. Low and high power objective. Coarse and fine adjustment.

MODEL G-3—100 to 400X **$59.00**
Triple divisible objective. Substage diaphragm turret. Most economical high school microscope.

MODEL S-2—75 to 250X **$33.50**
Double divisible objective. Simple and efficient for elementary science use.

SUBSTAGE LAMPS AND OTHER ACCESSORIES

Write for literature to Dept. ABT

TESTA MANUFACTURING CO.

418 S. Pecan St., Los Angeles 33, Calif.

New

Convenient

Time-Saving

SPECIAL TURTOX CATALOGS AND PRICELISTS

These catalogs and pricelists are all new, having been printed during August. Look over the following list and ask for all or those you wish.

Plant and Animal Specimens Embedded in Crystal-Clear Turtox Plastic. Many new preparations, including skeletons and both plant and animal life histories. Complete listings and illustrations.

Histology Microscope Slides. Our complete new listings of Turtox microscope slides of tissues and organs, including many preparations made from well-fixed human material.

Kodachromes of Human Histology. Lantern slides of more than 300 specially selected demonstration sections from the collection of the Department of Anatomy of the University of Illinois Medical School.

Biological and Anatomical Models. Turtox unbreakable models for biology, botany, zoology, embryology and human anatomy. Detailed descriptions and illustrations.

Three-Way Checklist of Biological Drawings. A handy reference checklist of the more than 300 subjects available as Turtox Charts, Key Cards and Quiz Sheets.

Taylor Botanical Kodachromes. A new and enlarged list of original Kodachrome lantern slides of algae and floral parts made for us by Professor William Randolph Taylor of the University of Michigan Department of Botany.

Parasitological Microscope Slides. A new and complete list of all Turtox microscope slides for parasitology courses.

Kodachromes of Reptiles and Amphibians. Another Turtox exclusive. Hundreds of original Kodachrome lantern slides of salamanders, frogs, toads, turtles, lizards and snakes.

GENERAL BIOLOGICAL SUPPLY HOUSE

Incorporated

761-763 East Sixty-Ninth Place

Chicago, 37, Illinois

PHASE FILMS

present the basic, the impressive, the truly significant biological phenomena—the marvelous interrelation of tissue structure and function in living bodies, the beautiful precision of the hereditary mechanism of cells.

Subjects ready: - "Syngamy and Alternation of Generations in Allomyces a Water Mold"; "Plant Growth and Mutation"; "Cell Division"; "Meiosis."

Now in our sixth year. Write for previews or descriptive literature.

ARTHUR T. BRICE

PHASE FILMS ROSS, CALIFORNIA

HERBARIUMS

for Mounting, Analyzing, and Preserving Botanical Specimens

The Cameron Herbarium

is most up-to-date in nomenclature and classification. That it is popular and practical is proved by its continued use by those who used the original edition, as well as by the new and increasing list of users each season.

The National Herbarium

is arranged on the check plan. It presents a complete botanical outline—the student analyzes the different specimens by placing check marks in the proper spaces.

H. L. FEIEREISEN, Publisher

Box 987 Cedar Rapids, Iowa

THE AMERICAN BIOLOGY TEACHER

Publication of the National Association of Biology Teachers.

Issued monthly during the school year from October to May. Entered as second class matter October 26, 1939, at the post office at Lancaster, Pa., under the Act of March 3, 1879.

Publication Office—111 E. Chestnut St., Lancaster, Pa.

Editor-in-Chief—B. Bernarr Vance, Route 1, Box 175, Dayton 5, Ohio.

Associate Editors—Robert McCafferty, 371 Broad St., Wadsworth, Ohio; Paul Klinge, 246 Ohmer Ave., Indianapolis 19, Ind. **(To receive all manuscripts for major articles.)**

Managing Editor—Muriel Beuschlein, 6431 S. Richmond, Chicago 29, Ill.

Assoc. Managing Editor—Robert Gering, Dugway Proving Grounds, Tooele, Utah.

Subscriptions, renewals, and notices of change of address should be sent to the Secretary-Treasurer, John P. Harrold, 110 E. Hines Ave., Midland, Mich. Correspondence concerning advertising should be sent to the Managing Editor.

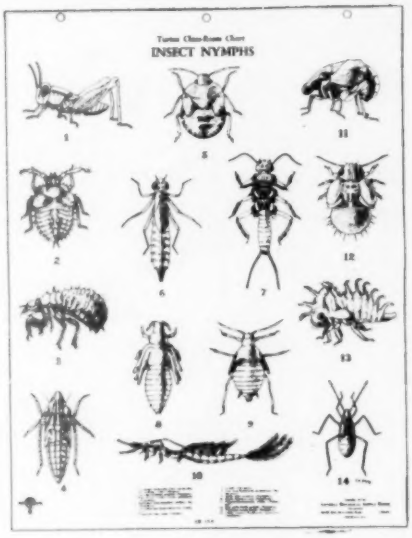
Annual membership, including subscription, $3.75, outside United States, $4.50.

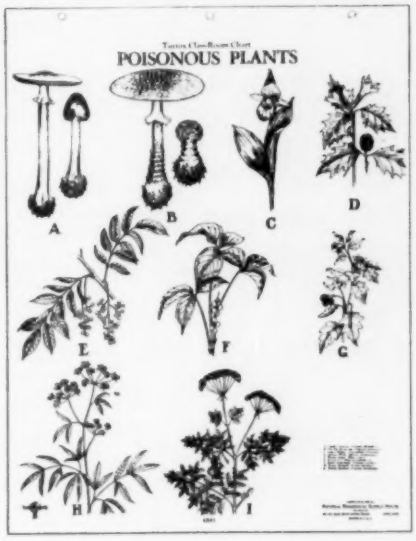
COVER PHOTO

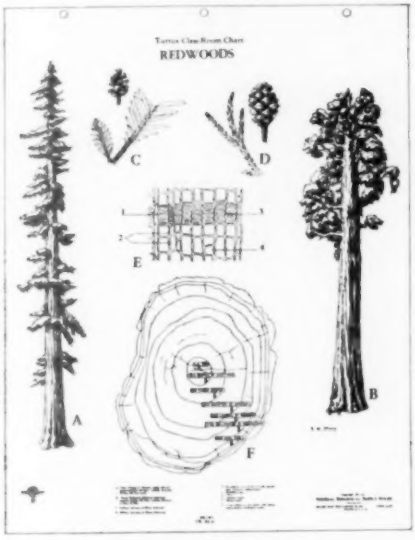
December is a good time of the year to collect the cocoons of various larger moths for winter study and later spring emergence of the adults. The cover photo shows a dormant pupa of *Platysamia cecropia* inside the 3-layered cocoon. The photo print was made from a color transparency taken with a Leica camera, focaslide, and a 135 mm. *f/4.5* Steinheill telephoto lens. Exposure was made on Daylight Kodachrome film, *1/5000 at f/11* and using electronic flash, by NABT member Charles F. Walcutt, 81 Sparks St., Cambridge, Mass., who also has contributed a number of other excellent photo prints of insect and bird life which will be used in later issues. Contact expert photographer Walcutt at the NABT Boston Convention Dec. 27–31 if you are interested in life science photography, or for color slides and other visual aids for your classes.

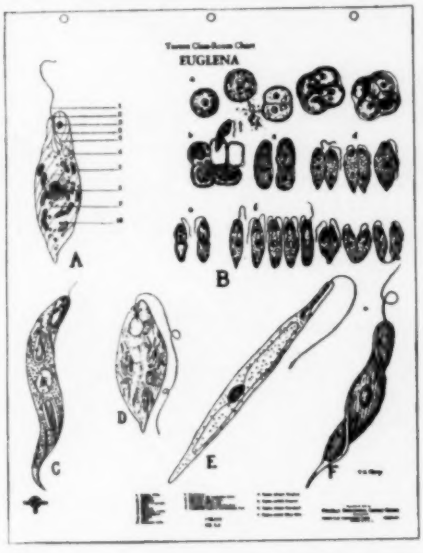
Come one, come ALL, by any means of biological or mechanical transportation, to **NABT's Annual Meeting in Boston, Mass., December 27–31!** Let's make this the largest and most enthusiastic get-together ever! Your teaching or research work will gain mightily in effectiveness, enthusiasm, and interest through personal contacts with fellow-workers in the life sciences and from the informative and inspirational programs.

A Selection of 350 Charts









The series of Turtox Class-Room Charts offers you a selection of more than 350 subjects, including more than 165 charts not found in any other series. See the listings on pages 264 to 303 of Turtox Biology Catalog No. 55, and write for the handy *Three-Way Checklist* of Turtox Charts and Biological Drawings.

TURTOX PRODUCTS

FOR THE BIOLOGICAL SCIENCES

GENERAL BIOLOGICAL SUPPLY HOUSE

Incorporated

761-763 East Sixty-Ninth Place, Chicago 37, Illinois

The Sign of the Turtox Pledges Absolute Satisfaction

The Welch Animal Collection

48 Specimens of Animal Units

No. ZM 800

This complete survey of the Animal Kingdom is a Life-Saver to the Alert Biology Teacher in adverse weather conditions. Labels are removable for quiz purposes. The collection includes:

PORIFERA
1. Grantia (simple sponge)
2. Commercial Sponge

COELENTERATA
3. Hydra
4. Obelia (colonial hydroid)
5. Gonionemus (jellyfish)
6. Aurelia (jellyfish)
7. Metridium (sea anemone)

CTENOPHORA
8. Pleurobrachia (comb jelly)

ECHINODERMATA
9. Asterias (starfish)
10. Amphioda (brittle starfish)
11. Strongylocentrotus (sea urchin)
12. Cucumaria (sea cucumber)

PLATYHELMINTHES
13. Fasciola (liver fluke)
14. Taenia serrata (tapeworm)

NEMATHELMINTHES
15. Ascaris (roundworm)
16. Necator (hookworm)

ANNELIDA
17. Lumbricus (earthworm)
18. Large leech
19. Nereis (sand worm)

ARTHROPODA
20. Barnacle
21. Cambarus (crayfish)
22. Uca (fiddler crab)
23. Scolopendra (centipede)
24. Limulus (horseshoe crab)
25. Argiope (garden spider)
26. Rhomalea (lubber grasshopper)
27. Dragon fly
28. Cicada
29. Cecropia moth
30. Monarch butterfly
31. Harpalus (ground beetle)

MOLLUSCA
32. Large chiton
33. Helix (large land snail)
34. Garden slug
35. Oyster
36. Loligo (squid)

CHORDATA
37. Amphioxus
38. Lamprey
39. Dogfish pup
40. Perch
41. Frog
42. Newt, or salamander
43. Turtle
44. Pine lizard
45. Chicken embryo (late stage)
46. Rat
47. Bat
48. Pig embryo

With Teachers Guide Complete per Set $24.00

Write for literature on biology charts, models, skeletons, preserved and live material, life histories and all biological laboratory needs.

W. M. Welch Scientific Company

DIVISION OF W. M. WELCH MANUFACTURING COMPANY

Established 1880

1515 Sedgwick St., Dept. F, Chicago 10, Ill., U. S. A.

Manufacturers of Scientific Instruments and Laboratory Apparatus